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Executive Summary

A statistical profile of the U.S. uranium industry as of December 31, 1986, is presented in this report. Selected data on U.S. uranium raw materials and uranium marketing activities are summarized on Table ES1 and briefly described below.

Uranium Raw Materials Activities

Exploration and Development. The amount of land held by uranium companies declined from 2.9 million acres in 1985 to 2.6 million acres in 1986. In domestic exploration activities, a total of 2.1 million feet of surface drilling was completed in 1986, compared to 1.8 million feet of drilling in 1985. The increase resulted from a large increase in development drilling primarily in Arizona, Colorado, Texas and Wyoming. Exploration drilling completed in 1986 declined by 22 percent as compared to 1985.

Total 1986 exploration and development expenditures were $22.06 million, an increase of 10 percent from 1985. Foreign companies contributed $11.3 million (51 percent) of this total expenditure as compared to $5.3 million (26 percent) in 1985.

Economic Reserves. Economic uranium reserves reported by the industry were 318.3 million pounds U_3O_8 at the end of 1986, an increase of 39 percent from the 229.2 million pounds reported in 1985. Approximately 83 percent of the 1986 economic reserves reported were for deposits located in New Mexico, Wyoming, and Texas. Of the total economic reserves, 58 percent were estimated using nonconventional mining methods and 42 percent using conventional mining methods.

Mine Production and Uranium Concentrate Production. Production of uranium from all mining sources other than byproduct recovery declined for the 6th year in a row.

Uranium concentrate production increased to 13.5 million pounds in 1986, the first increase since 1980. Of this amount, 8.9 million pounds were produced by conventional milling methods and 4.7 million pounds were from "other" methods of concentrate production. Utah and Texas together accounted for most of the 1986 uranium concentrate production.

Employment. Employment in the uranium industry was 2,120 in 1986, the lowest employment level in 20 years. Employment peaked at 21,951 person-years in 1979 and has declined each year since then.

Uranium Marketing Activities

Domestic Purchase Commitments by Utilities. In 1986, U.S. electric utilities signed uranium purchase contracts with domestic suppliers[1] for 14.3 million pounds of uranium. Domestic suppliers delivered a total of 18.9 million pounds to domestic utilities in 1986. At the end of 1986, market commitments for delivery in 1987 and beyond totaled 136.6 million pounds of uranium representing a decrease of 43.0 million pounds from the value reported in 1985.

Uranium Prices and Procurement Arrangements. The reported price of domestic uranium deliveries to utilities in 1986 averaged $30.01 per pound U_3O_8; prices ranged from about $10 per pound to over $100 per pound. The weighted average price per pound for 1986 deliveries for contracts signed in 1986 was $16.91. Market price contract settlements averaged $27.39 per pound U_3O_8; however, the average settled price for contracts that had no floor price was $16.93 per pound U_3O_8. This represents an increase of about 10 percent from the previous year in the average settled price under market price contracts without a floor price.

Foreign Purchases and Sales. Imports of uranium totaled 13.5 million pounds in 1986. The average price was $20.07 per pound, approximately the same as in 1985. Commitments for 1987 uranium imports total 8.4 million pounds.

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[1] In this report, "domestic suppliers" are domestic companies that sell uranium but are not electric utility companies. This includes uranium producers and agents.

Table ES1. Uranium Industry Summary Statistics

Item	1979	1980	1981	1982	1983	1984	1985	1986
				Uranium Raw Material Activities				
Exploration and Development								
Drilling (million feet)	41.1	28.2	14.2	5.4	3.2	2.6	1.8	2.1
Land Held for Exploration at End of Year (million acres)	17.2	14.9	9.6	5.2	4.6	3.4	2.9	2.6
Expenditures (million dollars)	315.91	266.96	144.76	73.61	36.86	26.48	20.10	22.06
Economic Reserves at End of Year (million pounds U_3O_8)	NA	NA	NA	NA	NA	199.1	229.2	318.3
Mine Production of Uranium (million pounds U_3O_8)	41.4	R44.4	R36.6	R23.6	23.5	R10.0	8.6	8.3
Uranium Concentrate Production (million pounds U_3O_8)	37.5	43.7	38.5	26.9	21.2	14.9	11.3	13.5
Uranium Concentrate Shipments (million pounds U_3O_8)	37.1	44.7	35.1	26.5	19.8	15.5	11.8	10.6
Employment (person-years expended)	21,951	19,919	13,676	8,967	5,615	3,597	2,446	2,120
				Uranium Marketing Activities				
Deliveries to Domestic Utilities[a] (million pounds U_3O_8)	[b]33.0	[b]35.0	[b]32.6	27.1	24.2	22.5	21.7	18.9
Average Price of Delivered Uranium (dollars per pound U_3O_8)	[b]23.85	[b]28.15	[b]34.65	38.37	38.21	32.65	31.43	30.01
Quantity of Uranium Imported[c] (million pounds U_3O_8)	3.0	3.6	6.6	17.1	8.2	12.5	11.7	13.5
Average Price of Imported Uranium (dollars per pound U_3O_8)	NA	43.10	32.90	[d]27.23	26.16	21.86	20.08	20.07
Quantity of Uranium Exported (million pounds U_3O_8)	6.2	5.8	4.4	6.2	3.3	2.2	5.3	1.6

[a] Excludes direct imports by domestic utilities.

[b] Includes delivery commitments to domestic utilities and agents.

[c] Includes imports by domestic utilities and domestic suppliers.

[d] Computation of quantity-weighted average price excludes the quantity associated with a large exchange transaction that occurred in 1982.

R: Revised data.

NA, Not available.

Sources: **Drilling**–Table 2. **Land Held**–Table 1. **Exploration and Development Expenditures**–Table 5. **Economic Reserves**–Table 19. **Mine Production**–Table 20. **Concentrate Production**–Table 24. **Concentrate Shipments**–Table 25. **Employment**–Table 28. **Deliveries to Utilities**–Table 30. **Average Delivered Price**–Table 35. **Imported Uranium**–Table 40. **Imported Uranium Price**–Table 42. **Exported Uranium**–Table 40.

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1. Introduction

Purpose and Background

The *Uranium Industry Annual* (UIA) provides current statistical data on the U.S. uranium industry for members of the Congress and for Federal and State agencies, the uranium and utility industries, and the public. It utilizes data from the "Uranium Industry Annual Survey," mandatory Form EIA-858; historical data collected by the Energy Information Administration (EIA) and by the Grand Junction (Colorado) Area Office of the U.S. Department of Energy (DOE); and other data from Federal agencies that preceded the DOE.

Uranium industry data collected in the EIA-858 survey provide a comprehensive statistical characterization of annual activities of the industry and include some information about industry plans over the next several years. Where these data are presented in aggregate form in this report, care has been taken to protect the confidentiality of data that are company-specific and still to convey an accurate and complete statistical representation of the industry data. Individual data items that have been withheld are included in the category totals.

This report consists of two major sections. The first addresses uranium raw materials activities and covers the following topics: exploration activities and expenditures, resources and reserves, mine production of uranium, production of uranium concentrate, and industry employment. The second major section is concerned with the following uranium marketing activities: uranium purchase commitments, uranium prices, procurement arrangements, uranium imports and exports, enrichment services, inventories, secondary market activities, utility market requirements, and related topics. A glossary and appendices are included to assist the reader in interpreting the substantial array of statistical data in this report and to provide background information about the survey.

The Form EIA-858, "Uranium Industry Annual Survey," replaces three previous EIA surveys -- Form EIA-717, "Survey of U.S. Uranium Exploration Activity"; Form EIA-491, "Survey of United States Uranium Marketing Activity"; and Form EIA-854, "U.S. Uranium Industry Financial Survey." The *Uranium Industry Annual* supersedes the two reports based on the previous EIA surveys, *Survey of U.S. Uranium Exploration Activity* and *Survey of United States Uranium Marketing Activity.* It also continues some of the time series of uranium resources and industry data that were presented in a report formerly issued by the DOE's Grand Junction Area Office, entitled Statistical Data of the Uranium Industry (GJO-100). Many of the historical time series covering uranium raw materials activities presented in this report contain data from the GJO-100 reports and from prior EIA reports. Not all of the data series contained in the GJO-100 reports, however, are continued in this report.

The firms required to submit Form EIA-858 were those that meet one or more of the following criteria:

- Firms that are controllers, were controllers during any portion of 1986, or are identified in EIA records as the most recent controllers of uranium properties, mines, mills, or plants
- Firms involved as controllers of uranium exploration and development ventures in the United States; firms involved as controllers of solution mining drilling in the United States; U.S. firms that conduct activities in foreign countries for uranium exploration and development that are funded by U.S. operations
- Firms that incurred uranium exploration expenditures in 1986 or planned such expenditures in 1987
- Firms that hold economic or subeconomic uranium reserves in specific properties by right of title, contract, lease, or concession and that are directly responsible for the development and exploitation of the reserves in those properties
- Firms that control uranium mining properties, including firms that are controllers of mines under joint ownership agreements or by contract agreements; firms that control *in situ* uranium recovery facilities
- Firms that control commercial uranium extraction from ore, leach solutions, or as a byproduct of the processing of a different commodity
- Firms that purchase, sell, or own domestic- or foreign-origin uranium.

The following portions of this section provide background information on the history of the U.S. uranium industry and DOE's legal authority for the collection of uranium industry data. The section concludes with a brief description of the industry.

History and Legal Authority

In the United States, prior to the 1940's, ores of uranium were mined primarily for the recovery of the associated radium and vanadium. The radium was prized for its use in medicine; the vanadium was used primarily to improve the metallurgical properties of steel, cast iron, and other metals. The recovered uranium was used in manufacturing glass and ceramics to produce yellow-to-brown colors, and it was also used in making special alloys of steel, copper, and nickel.

During the period from the early 1940's through 1946, the Manhattan Engineering District (MED), under the Army Corps of Engineers, was responsible for development of nuclear weapons. In that role, MED administered U.S. uranium procurement and research operations. The Atomic Energy Act, signed on August 12, 1946, resulted in the establishment of the Atomic Energy Commission (AEC). By Executive Order 9816, the Government-owned facilities of MED were transferred to the Atomic Energy Commission at midnight December 31, 1946.

The AEC procured uranium concentrates for Government programs during the period from 1947 through 1970. During those years, in definable stages, the market for uranium concentrates changed from being a monopsony with the Federal Government as the only buyer to being a completely commercial market with no Government purchases. Under the Government-sponsored programs during this period when the Government was a prime consumer of uranium for military purposes, the domestic supply of uranium changed from at first being in desperately short supply, then to being adequate, and then to being in surplus. Procurement policies and contracting practices were adopted, implemented, and modified in response to the Government's changing needs and the perceived lack or adequacy of uranium supplies with which to meet them.

The AEC's procurement policies and practices were not dictated solely by the Nation's defense needs. The agency was also guided by provisions of the Atomic Energy Acts of 1946 and 1954, which were designed to foster development and utilization of atomic energy for peaceful purposes. Therefore, uranium procurement policies also reflected concern for fostering and maintaining an industry that would be able to supply the Nation's expected uranium requirements for a developing private nuclear power industry.

The Atomic Energy Act of 1954 (Public Law 83-703) essentially ended the Federal monopsony over nonmilitary uses of atomic energy by making the private development and ownership of reactors lawful. However, the fuel to power privately owned reactors could be obtained only from the Atomic Energy Commission through lease arrangements, as stipulated in the Atomic Energy Act of 1954. By 1963, advances had taken place to further the commercial viability of nuclear power, and many interest groups contended that nuclear fuels should be allowed to compete with other fuels in the marketplace.

Legislation to permit private ownership of nuclear fuels was passed in 1964, in the form of the Private Ownership of Special Nuclear Materials Act (Public Law 88-489). The bill provided for toll-paid enrichment services by the AEC for privately owned uranium, and it also authorized the AEC to limit the offering of enrichment services for foreign-origin uranium owned by domestic customers to the extent necessary to maintain a viable domestic uranium industry. The latter provision has been the authority upon which the AEC and successor agencies have monitored the status of the U.S. uranium industry.

Public Law No. 97-415, which was enacted on January 4, 1983, further strengthened the Federal Government's role in monitoring the status of the U.S. uranium industry. This law amended the Atomic Energy Act by adding Section 170b, which requires the Secretary of Energy to determine annually, for the years 1983 to 1992, the viability of the domestic uranium industry.

Determination of the viability of the uranium industry requires a continuing review of the industry's status and prospects. Reports on domestic uranium raw materials and marketing activities have been published since 1968, first under the auspices of the Atomic Energy Commission, later by the Energy Research and Development Administration, then by the Assistant Secretary for Nuclear Energy (NE), Office of Uranium Enrichment and Assessment in the U.S. Department of Energy (DOE), and more recently by the Energy Information Administration (EIA). The legal authority for Form EIA-858, "Uranium Industry Annual Survey," is stated on the form as follows:

> *Data on this mandatory survey are collected under authority of Section 170B of the Atomic Energy Act of 1954 as amended (42 U.S.C. 790a) and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b).*

Uranium and the Uranium Industry: A Brief Description

Uranium is a silvery-white radioactive metal that, in the form of uranium dioxide (UO_2), is used as fuel for nuclear reactors. Heat produced by the reactors is used to generate steam, which is then used to generate electricity. One pound of natural uranium can produce as much energy as about 14,000 pounds of coal. Uranium is also used to produce various radioactive isotopes for medical and other scientific research.

The concentration of uranium in the earth's crust is approximately 2 parts per million. Uranium is more abundant than such "common" elements as mercury, silver, and gold. Many rocks contain minor quantities of uranium, and economically important quantities occur in naturally formed concentrations of minerals such as pitchblende, coffinite, and carnotite. Pitchblende, which contains various uranium oxides, is the richest uranium ore mineral.

In the United States, the bulk of uranium resources occurs in sandstone host rocks, including coarse- and fine-clastic materials. Uranium deposits in sandstones commonly consist of finely divided uranium mineral grains that fill pore spaces and may replace some sand grains and cementing materials of the host rock. Uraninite (an oxide of uranium) and coffinite (a uranium silicate) are the principal "primary" (or "black ore") uranium minerals in sandstone deposits. Pitchblende is the massive (i.e., noncrystalline) variety of uraninite. "Secondary" uranium minerals of importance in uranium deposits include carnotite and tyuyamunite (both hydrous vanadates), uranophane (a hydrous silicate), and metazeunerite (an arsenate). Other metals that are associated with uranium in some deposits are vanadium, copper, selenium, molybdenum, beryllium, and chromium.

Using modern exploration methods, some of which are sophisticated and costly, the search for uranium deposits has expanded from the evaluation of targets near the surface to include targets at depths in excess of 3,000 feet. A principal technique in uranium exploration involves the measurement of radioactivity in holes drilled to evaluate a prospective target. Systematic logging of boreholes with a variety of geophysical tools, including gamma-ray, self-potential, resistivity, and other surveys, is a standard practice in uranium exploration. Modern exploration procedures also include detailed geological mapping, geochemical surveys, analysis of borehole cuttings and cores in the field and laboratory, and economic and engineering studies making use of pertinent data developed in the search for new uranium deposits.

The principal States in which uranium ores are mined (including solution mining) for their uranium values are Arizona, Colorado, New Mexico, Texas, Utah, Washington, and Wyoming. Both openpit and underground mining methods are used to produce uranium ores from the ground: these methods are referred to as "conventional" mining. In addition, significant amounts of uranium concentrate are produced by "nonconventional" methods, such as solution (*in situ*) mining and as a byproduct of phosphate and copper mining.

At uranium mills, usually located near the mines, uranium is extracted from the ore by chemical leaching. The final product of uranium milling is uranium concentrate. Uranium concentrate (basically, U_3O_8), from mills, *in situ* mining, and byproduct recovery, is shipped to conversion facilities, for use in the production of uranium hexafluoride (UF_6).

Uranium hexafluoride is the feed material for the uranium enrichment process. UF_6 contains the uranium isotopes U-235 (0.7 percent), which is naturally fissionable, and U-238 (99.3 percent), which is not naturally fissionable. Gaseous UF_6 is passed through a series -- or cascade -- of porous membrane filters. Because UF_6 molecules containing the U-235 isotope diffuse through the filters more readily than those containing the U-238 isotope, the diffusion process, repeated several times in series, eventually results in two product streams of UF_6. Compared to the original feed material, one product stream is relatively enriched in the isotope U-235, and the other is relatively depleted in U-235.

In the enrichment process for commercial nuclear fuel, the concentration of U-235 is increased from the naturally occurring 0.7 percent to about 3.5 percent. This step is necessary because the amount of fissile U-235 in natural uranium is too low to sustain a nuclear chain reaction in light-water reactors.

At the fuel fabrication plant, the enriched UF_6 is converted to uranium dioxide (UO_2). The uranium dioxide is compressed into solid, cylinder-shaped pellets, which are placed in hollow rods made of a zirconium stainless steel alloy. These rods are grouped to form fuel rod assemblies, which are shipped to nuclear power plants for use as nuclear reactor fuel.

Loading uranium ore at an openpit mine. After loading, the ore is hauled to the surface for eventual milling to recover the uranium.

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2. Uranium Raw Materials Activities

Introduction

The development of a uranium producing industry in the United States began in the late 1940's, following World War II. The domestic industry was fostered in the years from 1947 through 1970 through the Government's uranium raw materials and procurement programs administered by the Atomic Energy Commission (AEC).

In the four decades since the AEC was established in 1946, a large quantity of information about uranium as a producible commodity has been compiled by the DOE and its predecessor agencies. Included are data collected since 1984 on Form EIA-858, "Uranium Industry Annual Survey", earlier surveys conducted by EIA, and data on uranium ore reserves and undiscovered resources compiled under prior Government-sponsored programs. Information from this data base has been used where possible in this report in the presentation of time series of data that quantify the historical and current status of important industry characteristics and trends.

A brief overview of the activities that comprise the uranium raw materials segment of the industry is provided below as a preface to the remainder of this chapter, in which data on uranium raw materials activities and the domestic uranium industry are presented.

Estimates of undiscovered uranium resources for various localities, some of which may lack production histories, also are made by the DOE utilizing the estimating methodology developed under the Department's National Uranium Resource Evaluation program, which was ended in 1983. Because of limited direct sample data, the estimation of undiscovered resources is not precise, and the reliability of the estimates is subject to uncertainty. These estimates of undiscovered resources are reported by the DOE in the international classifications of Estimated Additional Resources and Speculative Resources.

Estimates of discovered resources of uranium are also made by the DOE, through annual analysis of current and historical data on known uranium deposits. This includes data on the following: mine production of uranium and the resulting depletion and erosion phenomena; mining and processing costs; and newly discovered deposits. Estimates of discovered resources are reported by the DOE in the international category of Reasonably Assured Resources. Both undiscovered and discovered resources of uranium are estimated for selected forward-cost categories which are independent of a particular uranium price.

In the United States, exploration for new deposits of uranium is conducted solely by the private sector. The decision to conduct exploration on a particular property is made utilizing information from many sources, including Government-published reports and industry-sponsored studies. Exploration basically involves the identification of prospective areas with geologically favorable characteristics; development of data about surface and subsurface conditions using mapping, sampling, drilling, logging, and thorough analysis and reporting of all data developed. If favorable results are obtained, followup drilling is conducted. The ultimate aim of these efforts is to develop uranium reserves.

All information developed in a detailed exploration program contributes to determining the feasibility of mining a discovered deposit. The important parameters include: accurate data about the deposit's depth and configuration, the distribution of uranium mineralization in the deposit, the cutoff grade used to define the limits of the ore reserves, the average grade of the ore reserves, and the metallurgical characteristics of the ore. If the results of the analysis of the exploration data are favorable, a mining operation might be established at the deposit site, provided the ore is sufficiently rich in uranium to be recovered profitably. Discovered reserves that can be recovered at a profit are termed "economic" reserves; discovered reserves that do not meet currently economic costs are termed "subeconomic" reserves.

The methods associated with mine production of uranium and production of uranium concentrate are shown in Figure 1. Conventional mining includes openpit and underground methods. Openpit methods are used to produce ore from large, lower-grade deposits located near the surface or at shallow depths, depending on local subsurface conditions. Underground mining methods are generally used for deposits that are deeper and of higher-grade ore. Ore mined by conventional methods is hauled to mills for processing, or to buying stations or stockpiles for future processing.

Uranium can also be "mined" by means of *in situ* leaching methods, which involve leaching uranium from the ore "in place" without removing the ore from the ground. A leaching solution is circulated through the ore in place, the uranium-bearing leaching solution is then pumped to the surface, and the uranium is recovered.

Milling of conventionally mined ore begins with crushing and grinding of the ore to the particle size required for nearly complete chemical extraction of uranium. Then the prepared ore is chemically leached in a dilute slurry with acid or alkaline reagents to extract the uranium. After leaching is completed, the uranium is concentrated from the slurry by solution extraction techniques. The uranium is recovered from solution by chemical precipitation as uranium concentrate, which is then dried and packaged for shipment. Uranium is also recovered as a byproduct from the mining of copper and phosphate.

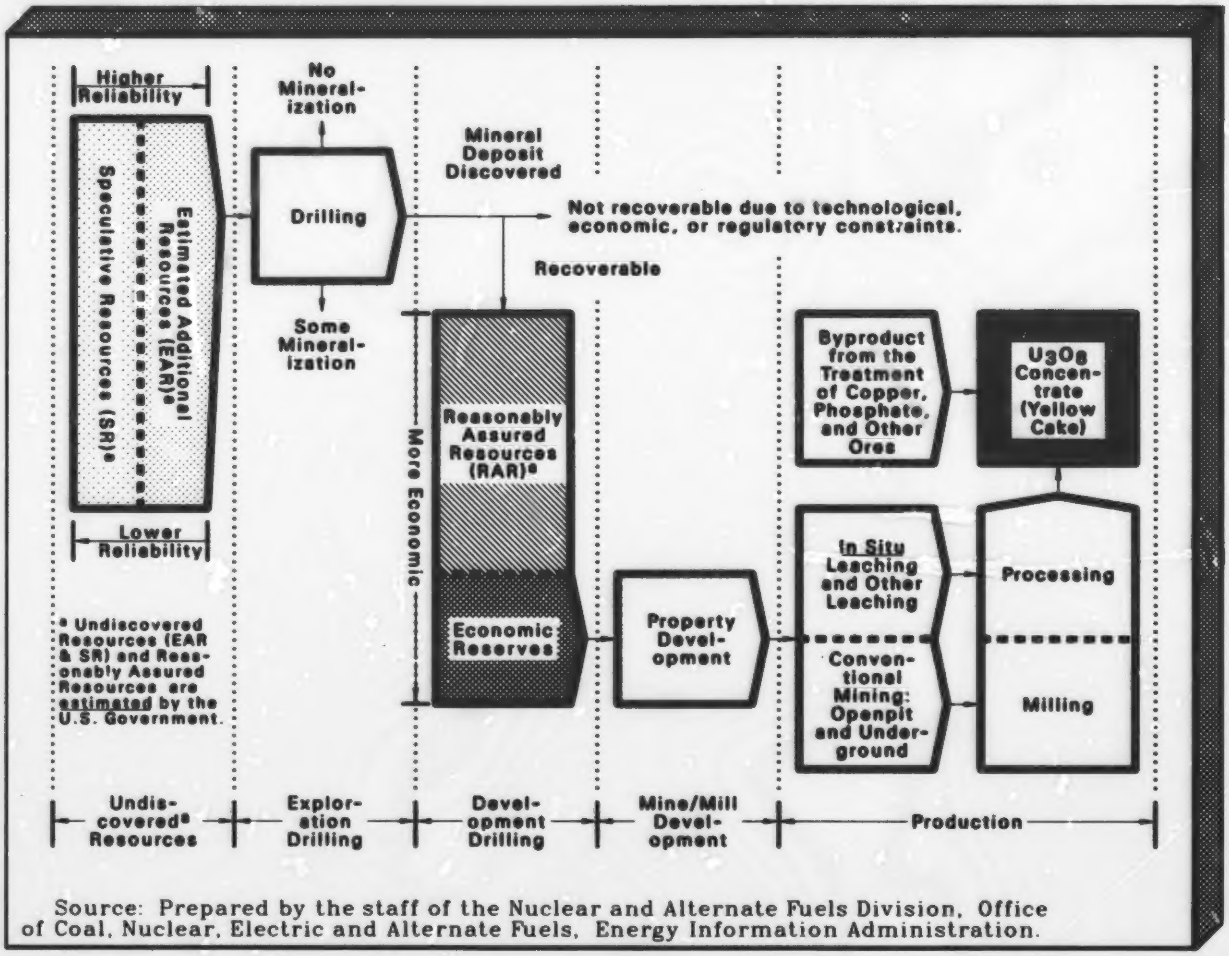
Figure 1. Distinction Between the Terms: Mine Production of Uranium and Production of Uranium Concentrate

Mine Production of Uranium-- **Removing uranium from beneath the earth's surface.**	**Production of Uranium Concentrate--** **Extracting and concentrating uranium from ores or leach solutions.**
Includes These Mining Sources:	Includes These Concentration Methods:
1. Uranium Ore Production from: a. Underground Mines b. Openpit Mines 2. In Situ Leaching 3. Other Leaching 4. Byproduct of Mining Other Commodities: a. Phosphate b. Copper	1. Conventional - Milling and/or Processing of Ore from: a. Underground Mines b. Openpit Mines 2. Nonconventional - Plant Processing of Solutions from: a. In situ Leaching Operations b. Other Leaching Operations c. Byproduct Recovery from: 1) Phosphoric Acid Production 2) Treatment of Copper Leaching Solutions

Source: Prepared by the staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration.

A graphic outline of the major stages in the production of uranium concentrate in the domestic industry is shown in Figure 2. Delineation of exploration targets, exploration and development drilling, evaluation of discovered mineral deposits to determine the economic resources, and mine and mill development are the major stages before production commences. Mining (including *in situ* leaching) and milling of uranium ore and processing of uraniferous solutions to recover U_3O_8 concentrate complete the production process.

Figure 2. Stages in Production of Uranium Concentrate


Higher Reliability
Estimated Additional Resources (EAR)ª
Speculative Resources (SR)ª
Lower Reliability
ª Undiscovered Resources (EAR & SR) and Reasonably Assured Resources are estimated by the U.S. Government.
No Mineralization
Drilling
Some Mineralization
Mineral Deposit Discovered
Not recoverable due to technological, economic, or regulatory constraints.
Recoverable
More Economic
Reasonably Assured Resources (RAR)ª
Economic Reserves
Property Development
Byproduct from the Treatment of Copper, Phosphate, and Other Ores
U3O8 Concentrate (Yellow Cake)
In Situ Leaching and Other Leaching
Conventional Mining: Openpit and Underground
Processing
Milling
Undiscoveredª Resources
Exploration Drilling
Development Drilling
Mine/Mill Development
Production

Source: Prepared by the staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration.

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Exploration Activities

Land Holdings and Acquisitions for Uranium Exploration

The amount of land held and land acquired by companies involved in domestic uranium exploration is shown in Table 1. At the end of 1986, 56 companies held about 2.6 million acres, about 9 percent less than the 2.9 million acres held by 52 companies at the end of 1985, and about 86 percent less than the maximum of 19 million acres held by 157 companies in 1978. Since 1978, the amount of land held by the industry and reported as of the end of the year has declined each year. The greatest annual decrease in land held by the industry was reported for 1981, when the total acreage held declined by about 5.3 million acres, or about 36 percent, from the 1980 total of 14.9 million acres.

The amount of land acquired during 1985 was 0.22 million acres, an increase of about 68 percent from the 0.13 million acres acquired in 1985 (Table 1). The 0.22 million acres acquired in 1986 represents only about 3 percent of the 6.39 million acres acquired in 1978, the peak year for land acquisition in the uranium industry.

The total cost of land acquired during 1986, $1.33 million, was substantially greater than the $0.89 million reported for 1985, representing an increase of about 50 percent from the 1985 total land acquisition cost. Expenditures in 1986 for land acquired for exploration were 3 percent of the total amount spent to acquire land in 1979, the peak year for land acquisitions. Types of land held and land acquired include: fee land, mineral fee, leases, patented and unpatented claims, and options to purchase mineral fee land. The totals shown in Table 1 do not include land held for production of uranium from commercial uranium deposits.

Table 1. Land Held and Acquired for Uranium Exploration, 1966-1986

Year(s)	Land Held for Exploration at End of Period			Land Acquired for Exploration During the Period			
	Number of Companies With Holdings	Million Acres Held	Percent Change From Prior Year in Acres Held	Million Acres Acquired[a]	Percent Change From Prior Year in Acres Acquired	Cost (million dollars)[b]	Average Cost (dollars per acre)
1966-1973	–	6.9	–	23.41	–	75.07	–
1974	69	9.0	–	3.32	–	12.61	3.80
1975	71	11.8	31.1	3.48	4.8	16.70	4.80
1976	96	15.0	27.1	4.75	36.5	13.89	2.92
1977	126	17.9	19.3	6.00	26.3	28.22	4.70
1978	157	19.0	6.1	6.39	6.5	30.73	4.81
1979	149	17.2	-9.5	4.21	-34.1	44.53	10.58
1980	127	14.9	-13.4	3.07	-27.1	35.06	11.42
1981	99	9.6	-35.6	2.31	-24.8	11.41	4.94
1982	85	5.2	-45.8	.83	-64.1	11.30	13.61
1983	84	4.6	-11.5	.46	-44.6	3.03	6.59
1984	62	3.4	-26.1	.48	4.3	1.56	3.26
1985	52	2.9	-14.7	.13	-72.9	.89	6.74
1986	56	2.6	-8.5	.22	68.1	1.33	6.00

[a] Does not include approximately 0.61 million acres acquired in the period 1966-1973 for which no cost data were reported.

[b] Includes costs for land acquisitions and rentals.

–, Not Applicable

Note: Average cost per acre shown here may not equal quotients obtained with independently rounded numerator and denominator.

Sources: 1966-1970–U.S. Department of Energy, Grand Junction Area Office, Press Release No. 582 (August 12, 1971). 1971-1980–U.S. Department of Energy, Grand Junction Area Office, *Uranium Exploration Expenditures and Plans Survey*, GJO-103 (Grand Junction, Colorado, 1972-1981). 1981-1983–Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Company Land Acquisition Costs

The costs of land acquired in 1986 ranged from $1.00 to $62.50 per acre; the average cost was $6.00 per acre, a decrease of about 11 percent from the average cost in 1985 (Table 1). During the period from 1976 through 1986, the average cost per acre of acquired land ranged from $2.92 (in 1976) to $13.61 (in 1982). A total of 16 companies reported data for land acquisitions in 1986, as compared to 20 in 1982, 21 in 1983, 20 in 1984, and 9 in 1985.

Surface Drilling

Total surface drilling in the United States in 1986, including exploration and development drilling, was 2.07 million feet and 3,831 drill holes (Table 2). This total footage was 18 percent greater than the 1.76 million feet reported by the industry for 1985, and the total number of holes drilled increased by about 5 percent. During 1986, 35 companies conducted uranium exploration programs, as compared to 30 in 1985. Of the 35 companies, 26 conducted only exploration drilling programs, 5 conducted exploration and development drilling, and 4 conducted only development drilling programs. The total footage reported in 1986, although greater than the 1985 total footage, was the second lowest annual quantity of drilling reported since 1978, the peak year for surface drilling.

Table 2. Surface Drilling Activities, 1966-1986

Year(s)	Number of Companies	Number of Holes Drilled	Percent Change From Prior Year	Million Feet Drilled	Percent Change From Prior Year	Cost (million dollars)[a]	Percent Change From Prior Year	Average Cost (dollars per foot)	Percent Change From Prior Year
1966-1973	([b])	351,114	–	117.53	–	164.87	–	1.29	–
1974	([b])	39,700	–	21.56	–	44.76	–	2.08	–
1975	([b])	55,886	40.8	25.42	17.9	73.81	64.9	2.90	39.4
1976	([b])	67,640	21.0	34.80	36.9	108.97	47.6	3.13	7.9
1977	([b])	93,452	38.2	45.58	31.0	155.03	42.3	3.40	8.6
1978	([b])	104,353	11.7	48.10	5.5	169.68	9.4	3.53	3.8
1979	([b])	90,646	-13.1	41.08	-14.6	162.98	-3.9	3.97	12.5
1980	([b])	59,795	-34.0	28.19	-31.4	125.70	-22.9	4.46	12.3
1981	([b])	26,424	-55.8	14.22	-49.6	67.90	-46.0	4.77	7.0
1982	69	9,967	-62.3	5.35	-62.4	27.85	-59.0	5.20	9.0
1983	60	7,298	-26.8	3.17	-40.8	14.42	-48.2	4.55	-12.5
1984	R43	5,521	-24.3	2.55	-19.6	11.85	-17.8	4.65	2.3
1985	30	3,649	-33.9	1.76	-30.9	5.53	-53.3	3.14	-32.4
1986	35	3,831	5.0	2.07	17.6	7.74	39.9	3.74	19.0

[a] Includes costs for exploration and development drilling.

[b] Data are not available for the period 1966-1981.

–, Not applicable.

Note: Percent change may not equal quotients obtained with independently rounded numerator and denominator.

Note: Average cost per foot shown here may not equal quotients obtained with independently rounded numerator and denominator.

R: Revised data.

Sources: 1966-1970–U.S. Department of Energy, Grand Junction Area Office, Press Release No. 582 (August 12, 1971). 1971-1980–U.S. Department of Energy, Grand Junction Area Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982*, GJO-103(81) (Grand Junction, Colorado, May 1981). 1981-1983–Energy Information Administration,*Survey of U.S. Uranium Exploration Activity 1983*,DOE/EIA-0402(83) (Washington, DC, July 1984). 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Surface drilling for uranium consists of both exploration and development drilling (Table 3). Exploration drilling is done in search of new ore deposits or extensions of known deposits. The amount of exploration drilling during 1986 (1.1 million feet) was 22 percent less than that reported for 1985 and 96 percent less than the annual footage reported in the peak year, 1978. The number of exploration holes drilled in 1986 decreased by 31 percent, to 1,985 holes. The average cost per foot of exploration drilling in 1986 increased to $5.83, about 61 percent greater than the 1985 cost per foot drilled.

A comparison of drilling for the 31 companies that reported exploration drilling programs in 1986 showed that 5 companies conducted programs of less than 1,000 feet of total drilling, 10 companies drilled 1,001 to 10,000 feet, 13 companies drilled 10,001 to 100,000 feet, and 3 companies conducted programs of more than 100,000 feet of exploration drilling. This distribution is similar to that for the 28 companies that reported exploration drilling programs for 1985, when there were 2, 9, 12, and 5 companies, respectively, in these four drilling footage categories.

Development drilling is done to define the size, shape, and grade of known deposits and to provide data needed for mine planning (Table 3). During 1986, development drilling was reported by 9 companies, as compared to 4 in 1985 and 16 in 1984. Development drilling rose from 0.34 million feet in 1985 to 0.97 million feet in 1986. The number of development holes drilled also increased from 772 in 1985 to 1,846 in 1986. The average cost per foot of development drilling in 1986 increased to $1.38, or $0.23 per foot more than the average cost in 1985. This increase reflects a general increase in the overall cost of development drilling across most companies reporting, as well as the lower than average drilling costs reported by two companies for 1986. The total annual surface drilling since 1975 and drilling planned for 1987 are shown in Figure 3.

Table 3. Exploration and Development Drilling Activities, 1966-1986

Year(s)	Exploration Drilling[a]				Development Drilling[b]			
	Number of Holes Drilled[c]	Million Feet Drilled[c]	Cost (million dollars)[c] [d]	Average Cost (dollars per foot)[c]	Number of Holes Drilled[c]	Million Feet Drilled[d]	Cost (million dollars)[c] [d]	Average Cost (dollars per foot)[c]
1966-1973	226,721	69.78	124.52	1.39	124,393	27.75	26.66	0.96
1974	27,400	14.72	34.95	2.37	12,300	6.84	9.81	1.43
1975	34,285	15.69	51.92	3.31	21,601	9.73	21.89	2.25
1976	40,409	20.36	70.70	3.47	27,231	14.44	38.30	2.65
1977	62,597	27.96	99.40	3.56	30,855	17.62	55.60	3.16
1978	75,068	28.95	113.30	3.91	29,285	19.15	56.40	2.95
1979	60,457	28.07	119.60	4.26	30,191	13.01	43.40	3.34
1980	39,607	19.60	94.80	4.84	20,168	8.59	30.90	3.60
1981	17,751	10.87	56.43	5.19	8,673	3.35	11.47	3.42
1982	6,965	4.23	20.94	4.96	3,002	1.13	6.90	[e] 6.13
1983	4,287	2.09	10.60	5.07	3,011	1.08	3.81	3.55
1984	4,798	2.26	10.53	4.66	723	.29	1.32	4.60
1985	2,877	1.42	5.14	3.63	772	.34	.39	1.15
1986	1,985	1.10	6.40	5.83	1,846	.97	1.35	1.38

[a] Includes (1) drilling in search of new ore deposits or extensions of known deposits, and (2) drilling at the location of a discovery up to the time the company decides sufficient ore reserves are present to justify commercial exploitation.

[b] Includes all drilling of an ore deposit to determine more precisely size, grade, and configuration subsequent to the time that commercial exploitation is deemed feasible.

[c] Number of holes for 1981 and prior years and data for drilling footage, total cost, and average cost for 1982 and prior years as reported in *Statistical Data of the Uranium Industry*, GJO-100(83), January 1, 1983.

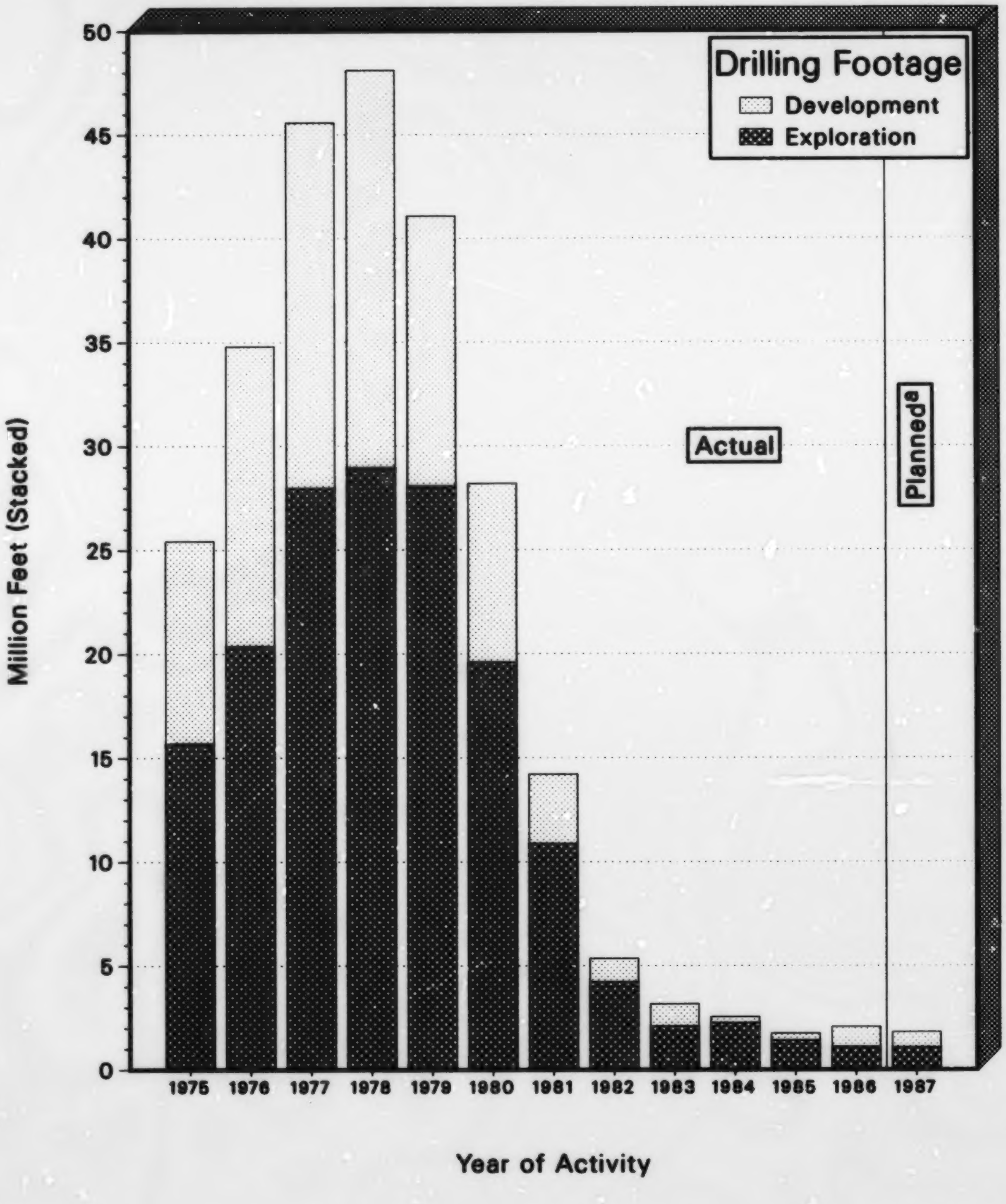
[d] Does not include the costs for 2.074 million feet of exploration drilling and 0.53 million feet of development drilling for 1966-1971 for which drilling costs were reported as "other exploration expenditures." Does not include costs for 9.966 million feet of exploration and development drilling reported together at a cost of $13.7 million, 1966-1972.

[e] This high value is attributable primarily to one company"s large percentage of the total expenditures for development drilling in 1982.

Note: Average cost per foot shown here may not equal quotients obtained with independently rounded numerator and denominator.

Sources: **1966-1970**–U.S. Department of Energy, Grand Junction Area Office, Press Release No. 582 (August 12, 1971).**1971-1980**–U.S. Department of Energy, Grand Junction Area Office, *Uranium Exploration Expenditures in 1980 and Plans for 1981-1982,* GJO-103(83) (Grand Junction, Colorado, May 1981). **1981-1983**–Energy Information Administration,*Survey of U.S. Uranium Exploration Activity 1983,* DOE/EIA-0402(83) (Washington, DC, July 1984). **1984-1985**–Energy Information Administration, *Uranium Industry Annual 1985,* DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 3. Exploration and Development Drilling Footage, 1975-1987



[a] Planned at the end of 1986.

Sources: ●1975–1986: See Table 3. ●1987: See Table 8.

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Surface Drilling Footage by State

The amounts of surface drilling in 1986 increased in all the major States reported, except Utah, where the total footage declined by about 34 percent as compared to 1985 (Figure 4). Three States accounted for nearly 83 percent of the total surface drilling reported for 1986: Arizona (16 percent), Texas (37 percent), and Wyoming (30 percent) (Table 4). Development drilling footages increased in Texas, Wyoming, and Colorado, and a modest amount was reported for Arizona. No development drilling was reported for Utah in 1986, where a small amount was done in 1985. Also, no development drilling was reported for New Mexico in 1985 or 1986; 21 percent of the U.S. economic reserves of uranium in 1986 was reported for properties in that State.

Total exploration drilling footage for 1986 declined by about 22 percent as compared to 1985. Exploration drilling increased in Arizona, Colorado, and New Mexico, but there were declines in exploration drilling in Texas, Utah, Wyoming, and the other States in 1986.

Company Surface Drilling Costs, 1985

Costs incurred from surface drilling activities include those for ground surveys, road construction and site preparation, drilling, downhole geophysical surveys, sample collection and analysis, and geological and other technical support. In 1986, costs for surface drilling ranged from $0.50 to $32.82 per foot drilled. The average surface drilling cost was $3.74 per foot, an increase of about 19 percent from the average cost of $3.14 per foot in 1985 (Table 2).

Table 4. Surface Drilling by State, 1986

State	Exploration Drilling		Development Drilling		Total Surface Drilling		State Total Surface Drilling as Percent of U.S. Total	
	Number of Holes	Thousand Feet	Number of Holes	Thousand Feet	Number of Holes	Thousand Feet	Number of Holes	Drilling Footage
Arizona	479	317	21	11	500	327	13.1	15.8
Colorado	126	72	244	54	370	125	9.7	6.0
New Mexico	14	25	0	0	14	25	.4	1.2
Texas	190	101	1,131	673	1,321	774	34.5	37.4
Utah	195	132	0	0	195	132	5.1	6.4
Wyoming	850	375	450	235	1,300	610	33.9	29.5
Others[a]	131	76	0	0	131	76	3.4	3.7
Total	1,985	1,097	1,846	973	3,831	2,070	100.0	100.0

[a] Includes Michigan, Nebraska, Oregon, and Washington.

Note: Totals may not equal sum of components due to independent rounding.

Note: Percentages were calculated using unrounded data.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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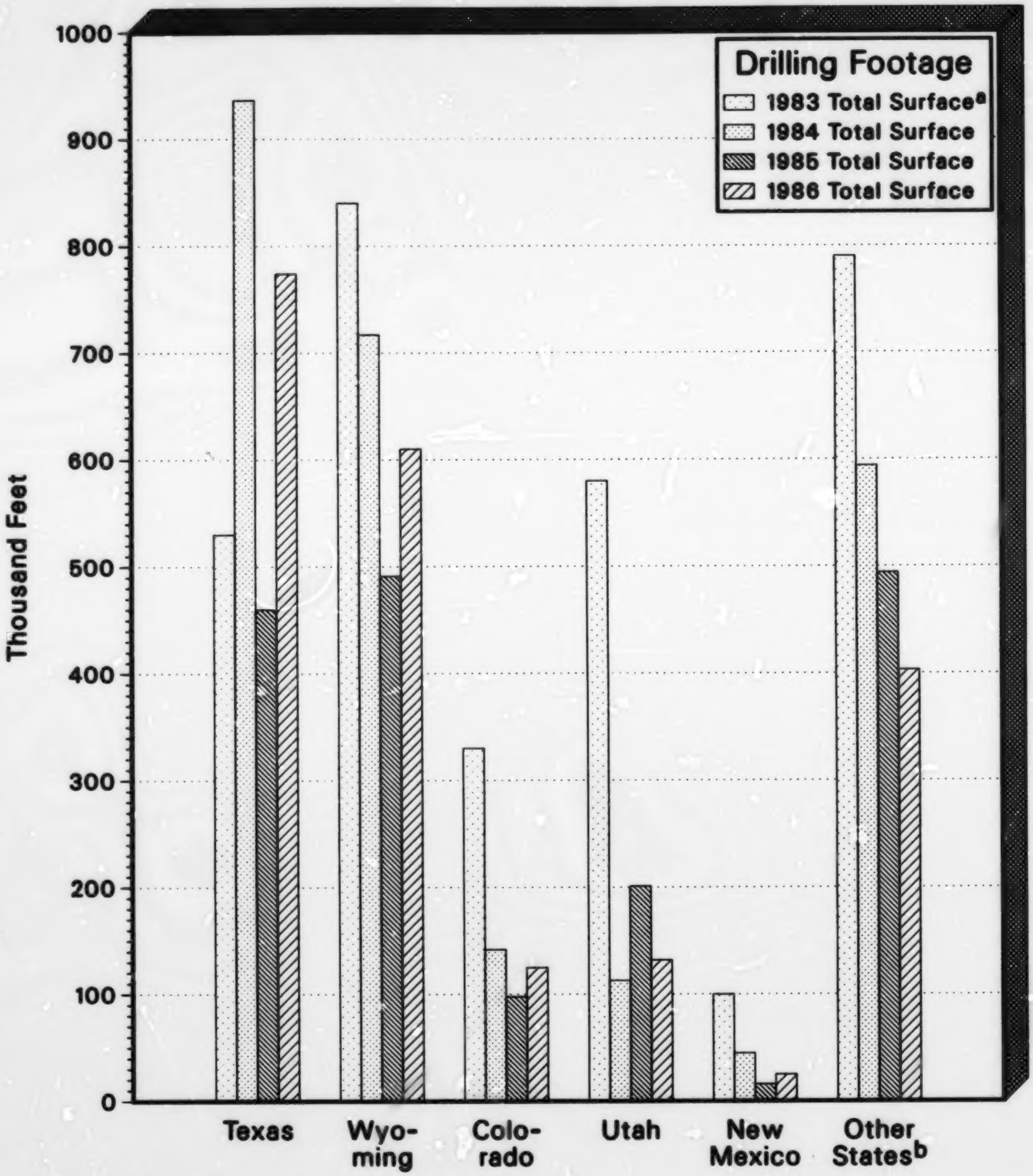
Figure 4. Surface Drilling Footage by State, 1983 Through 1986



[a] 1983 is the earliest year for which state data are available.
[b] Other States include Arizona, California, Michigan, Montana, Nebraska, Nevada, Oregon, South Dakota, and Washington.

Sources: •1986: See Table 4. •1984–1985: Energy Information Administration (EIA), Uranium Industry Annual 1985, November 1986. •1983: EIA Survey of U.S. Uranium Exploration Activity 1983, July 1984.

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Total Domestic Exploration Expenditures

The total expenditures for uranium exploration shown in Table 5 include all expenditures for land acquired and held, exploration drilling costs, development drilling costs, and other exploration expenditures. Total exploration expenditures in 1986 were $22.06 million, which is an increase of about 10 percent over the total expenditure in 1985. The 1986 total consisted of $1.33 million for land acquisition, $7.74 million for surface drilling, and $12.99 million for other exploration activities. A summary of domestic exploration expenditures for the period from 1975 through 1986 and the planned total expenditures for 1987 is shown in Figure 5.

For 1986, 34 companies reported costs incurred for exploration activities in the "other" category, the same number of companies as in 1985 and two more than reported costs in this category in 1984. The category of Other Exploration Expenditures does not include costs for land and drilling, solution mining production, or work in foreign countries.[2] The remaining 59 companies that provided data on Schedule A, Form EIA-858, reported no exploration expenditures in this category.

Table 5. Exploration and Development Expenditures, 1966-1986
(Million Dollars)

Year(s)	Surface Drilling[a]	Land Acquisition[b]	Other[c]	Total Expenditures	Percent Change From Prior Year
1966-1973	164.87	75.07	94.43	334.37	–
1974	44.76	12.61	21.71	79.08	–
1975	73.81	16.70	31.52	122.03	54.3
1976	108.97	13.89	47.79	170.65	39.8
1977	155.03	28.22	74.83	258.08	51.2
1978	169.68	30.73	113.85	314.26	21.8
1979	162.98	44.53	108.40	315.91	.5
1980	125.70	35.06	106.20	266.96	–15.5
1981	67.90	11.41	65.45	144.76	–45.8
1982	27.85	11.30	34.47	73.61	–49.2
1983	14.42	3.03	19.41	36.86	–49.9
1984	11.85	1.56	13.07	26.48	–28.2
1985	5.53	.89	13.67	20.10	–24.1
1986	7.74	1.33	12.99	22.06	9.8

[a] Includes costs for exploration and development drilling.

[b] Includes costs for land acquisitions and rentals.

[c] Includes costs for geologic and geophysical investigations and research costs incurred by field personnel during exploration, and overhead and administrative charges specifically associated with supervising and supporting exploration activities.

–, Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 1966-1974—U.S. Energy Research and Development Administration, Grand Junction Area Office, *Uranium Exploration Expenditures in 1974 and Plans for 1975-76*, GJO-103(75) (Grand Junction, Colorado, April 1975). 1975-1983—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). 1984-1985—Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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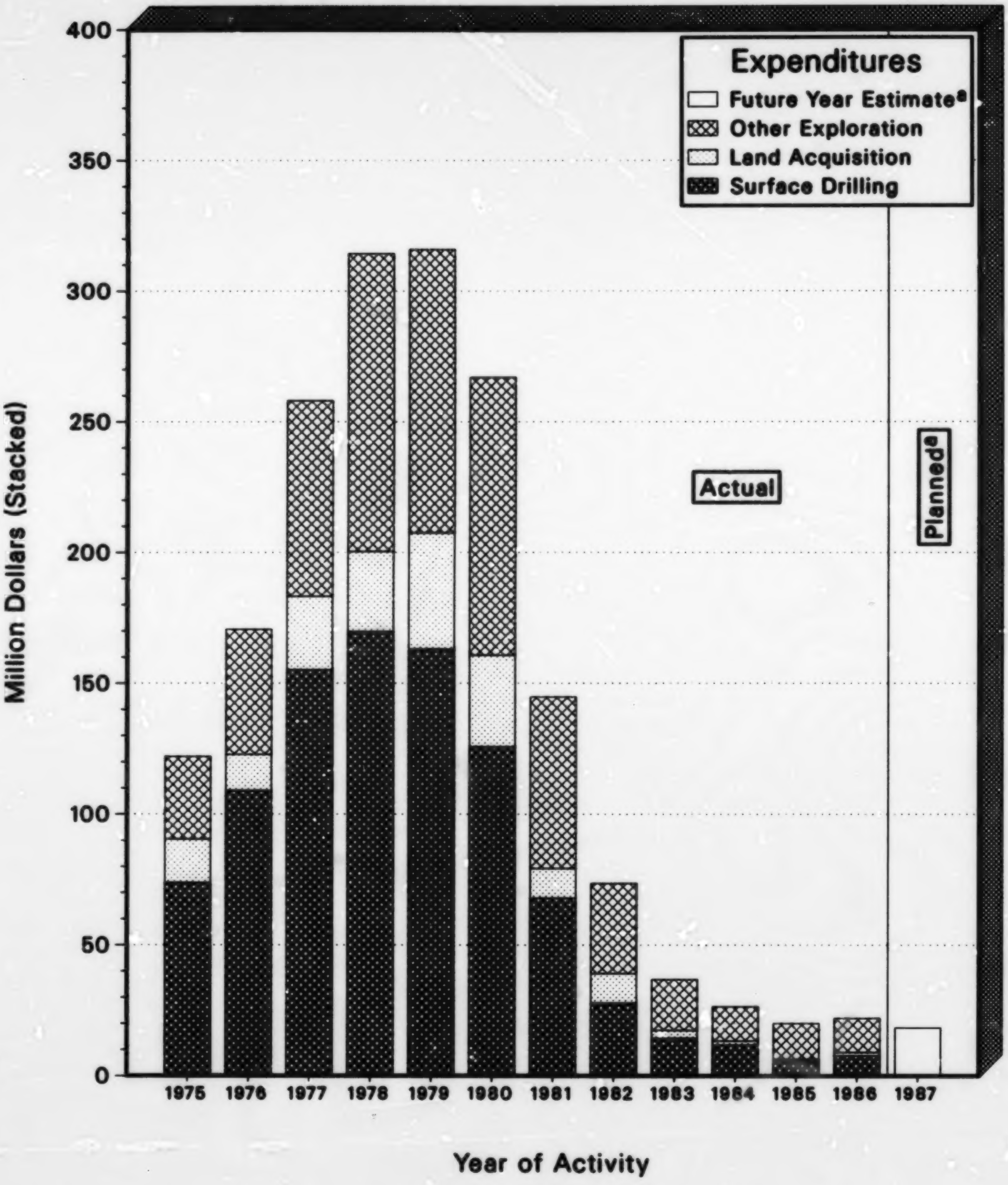
[2] The category "Other Exploration Expenditures" includes costs for geologic and geophysical investigations and research costs incurred by field personnel during exploration, and overhead and administrative charges specifically associated with supervising and supporting exploration activities.

Figure 5. Exploration Expenditures, 1975-1987



[a] Future year expenditure estimates are reported at the end of the survey year for the following year.

See footnote '3' to Table 5 for components of Other Exploration expenditures.

Sources: •1975–1986: See Table 5. •1987: See Table 8.

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Participation by U.S. Companies in Foreign Uranium Exploration

Three U.S. companies reported actual expenditures for exploration in foreign countries during 1986, and two companies reported planned expenditures for 1987. The total actual expenditures reported for 1986 exceeded the amount reported as planned for that year at the end of 1985, but they were below the reported total of $1.83 million for 1984 expenditures by U.S. companies in foreign countries. Expenditures planned for 1987 foreign exploration activities, as reported on Form EIA-858, are greater than the actual expenditures reported for 1986.

Summaries of actual expenditures for the years 1975 through 1986 and plans for 1987 by U.S. companies for uranium exploration in foreign countries are shown in Table 6. Data on total exploration expenditures for 1985, 1986, and 1987 and some country totals for 1983 and 1984 are withheld from Table 6 to avoid disclosure of individual company data.

Table 6. Actual and Planned Exploration Expenditures by U.S. Companies in Foreign Countries, 1975-1987
(Million Dollars)

Year	Africa	Canada	Australia	Others[a]	Total	Percent Change From Prior Year
1975	2.66	1.00	1.34	0.10	5.10	--
1976	4.36	2.60	1.97	9.87	18.80	268.6
1977	7.50	3.60	4.70	15.36	31.16	65.7
1978	6.98	3.47	3.56	21.88	35.89	15.2
1979	7.05	8.75	6.22	21.22	43.24	20.5
1980	7.87	7.06	8.59	15.45	38.97	-9.9
1981	6.74	7.71	7.98	12.85	35.28	-9.5
1982	.75	4.16	4.32	4.58	13.82	-60.8
1983	W	W	1.09	R3.58	4.68	-66.1
1984	W	W	W	W	1.83	-60.9
1985	0	0	W	W	W	W
1986	0	W	W	W	W	W
1987[b]	0	W	W	0	W	W

[a] Includes expenditures in countries that were not identified in the survey responses for 1975 through 1981. For 1982 through 1987, includes expenditures in Australia, Canada, Niger, Paraguay, South Africa, Spain, and West Germany.

[b] Planned.

--, Not applicable.

W, Withheld to avoid disclosure of individual company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 1975-1980--U.S. Department of Energy, Grand Junction Area Office, *Uranium Exploration Expenditures and Plans Survey*, GJO-103 (Grand Junction, Colorado).1981-1983--Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). 1984-1985--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Foreign Participation in Domestic Exploration

U.S. companies reported that foreign interests contributed about $11.3 million to U.S. exploration activities during 1986, a large increase over the total of $5.3 million contributed from foreign sources in 1985. Foreign participation in 1986 accounted for about 51 percent of the total exploration expenditures for the industry; in 1985 foreign participation accounted for 26 percent. Eight companies reported contributions from foreign sources, two more than in 1985. Table 7 and Figure 6 summarize uranium exploration expenditures contributed by foreign interests for the period 1976 through 1986. These contributions from foreign sources are included in the exploration expenditures reported in Tables 2 and 3. Figure 6 also shows the trend in the number of U.S. companies with foreign joint-venture partners and in total expenditures for exploration by those partners for the period 1976-1986.

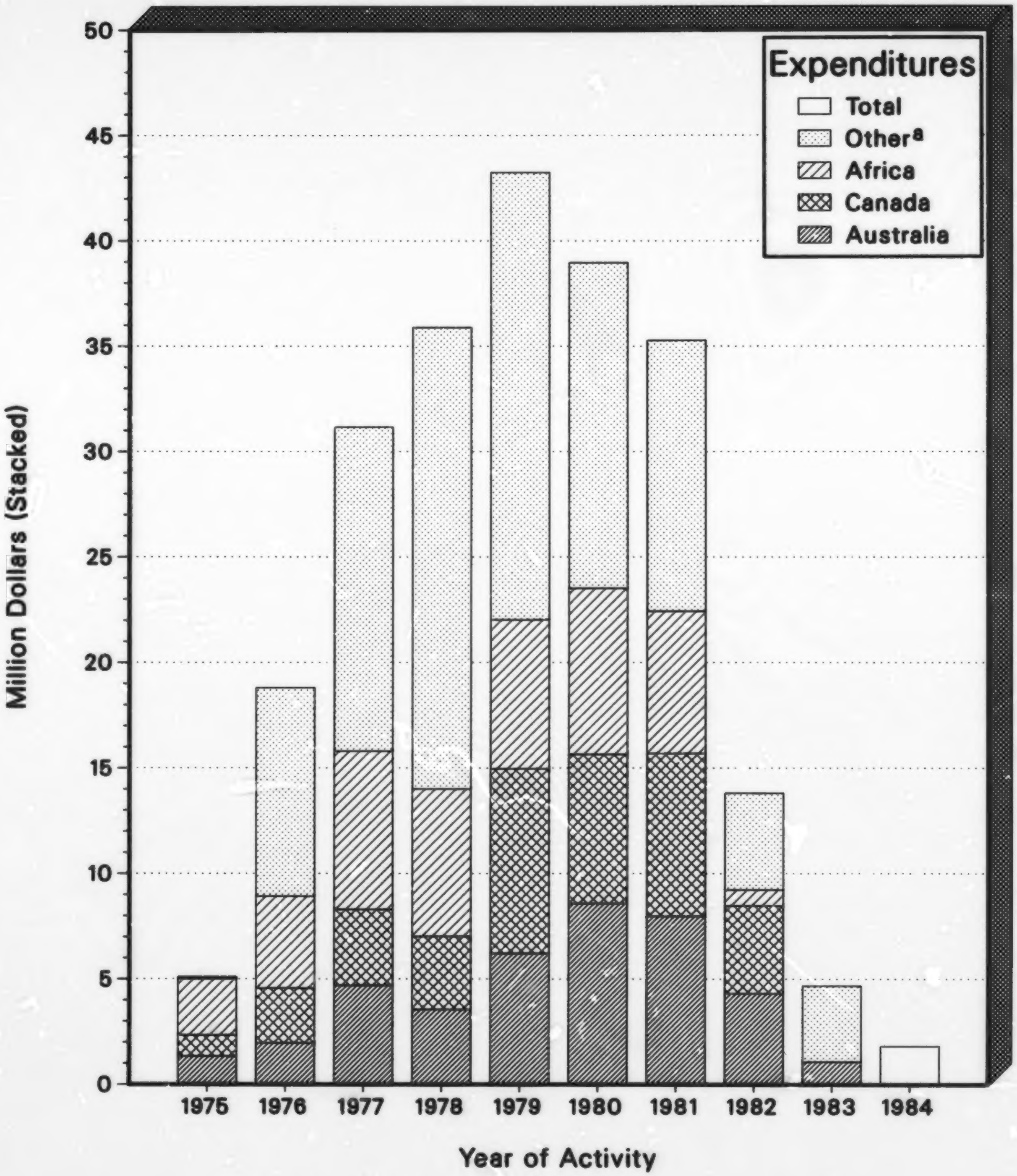
Table 7. U.S. Company Reports of Foreign Participation in Domestic Exploration, 1976-1986

Year	Number of Companies Reporting Joint Ventures	Expenditures by Foreign Companies	
		Million Dollars	Percent of Total U.S. Expenditures
1976	15	13.2	8
1977	17	21.7	8
1978	31	39.3	13
1979	28	34.1	11
1980	28	37.6	14
1981	25	24.6	17
1982	14	14.6	20
1983	9	4.8	13
1984	9	6.6	25
1985	6	R5.3	26
1986	8	11.3	51

R, Revised data.

Sources: 1976-1980--U.S. Department of Energy, Grand Junction Area Office,*Uranium Exploration Expenditures and Plans Survey*, GJO-103 (Grand Junction, Colorado). 1981-1983--Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). 1984-1985--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 6. Expenditures for Foreign Uranium Exploration by U.S. Companies, 1975-1984



Note: 1985, 1986, and 1987 data are not shown to avoid disclosure of company data.
[a] ●1976–1981: Includes expenditures for countries not identified in the survey responses. ●1982–1984: Includes expenditures for various years for Australia, Canada, Niger, Paraguay, South Africa, Spain, and West Germany which were withheld to avoid company data disclosure.

Source: See Table 6.

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Planned and Actual U.S. Exploration Activities, 1974 Through 1986

Of the 93 companies that responded on Schedule A, Form EIA-858, for 1986, 35 companies reported exploration and development drilling activities for the year. In comparison, 29 companies reported planned exploration and development drilling programs for 1986 on the 1985 Uranium Industry Annual Survey, Form EIA-858. Of the 35 companies that conducted drilling programs in 1986, 24 reported prior plans for 1986 drilling and 11 did not report prior plans. Five companies that reported plans for 1986 drilling on the 1985 survey did not conduct drilling programs during the year. A larger number and a somewhat different mix of companies conducted exploration and development drilling during 1986 than had originally reported the planned drilling at the end of 1985. The amounts of actual drilling and expenditures reported for 1986 (2.1 million feet and $22 million, respectively) were correspondingly greater than the projected values reported on the 1985 survey. Table 8 compares statistics for planned and actual exploration activities for the years 1980 through 1986 and shows reported planned activities for 1987.

A total of 27 companies reported planned exploration and development drilling programs for 1987 on the 1986 Form EIA-858. Total drilling planned for 1987 is projected to be about 12 percent less than the amount of drilling done in 1986, and total expenditures are projected to be 16 percent below the 1986 level. Figures 7 and 8 provide graphic comparisons of data for planned versus actual drilling footages and planned versus actual expenditures.

Table 8. Actual and Planned Exploration and Development Activities, 1980-1987

Year	Activity					
	Exploration Drilling		Development Drilling		Total Surface Drilling (million feet)	Total Expenditures[a] (million dollars)
	Thousand Holes	Million Feet	Thousand Holes	Million Feet		
1980						
Planned[b]	NA	27.9	NA	11.5	39.4	277
Actual	39.6	19.6	20.2	8.6	28.2	267
1981						
Planned[b]	NA	R15.2	NA	R5.2	20.4	175
Actual	17.8	10.9	8.7	3.4	14.2	145
1982						
Planned[b]	NA	R6.4	NA	R2.5	8.9	74
Actual	7.0	4.2	3.0	1.1	5.4	74
1983						
Planned[b]	NA	R2.2	NA	R1.2	3.4	40
Actual	4.3	2.1	3.0	1.1	3.2	37
1984						
Planned[b]	4.6	2.6	1.6	.9	3.5	33
Actual	4.8	2.3	.7	.3	2.5	26
1985						
Planned[b]	3.3	1.8	.5	.1	1.9	21
Actual	2.9	1.4	.8	.3	1.8	20
1986						
Planned[b]	2.2	1.5	.8	.4	1.9	19
Actual	2.0	1.1	1.8	1.0	2.1	22
1987 Planned[b]	1.7	1.1	1.4	.7	1.8	18

[a] Total expenditures for surface drilling and all exploration activity.

[b] Activity for the year indicated, planned at the end of the previous year.

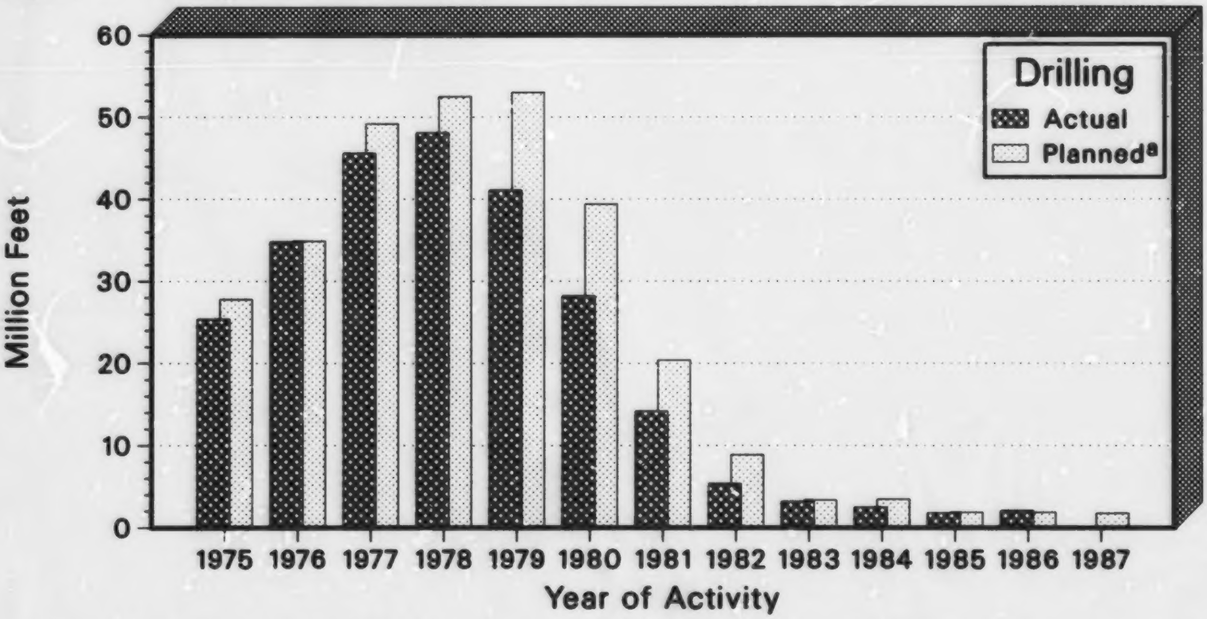
R, Revised data.

NA, Not available.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1980-1981 Planned**—U.S. Department of Energy, Grand Junction Office, "Uranium Exploration Expenditures and Plans Survey," GJO-103 (Grand Junction, Colorado). **1982-1983 Planned**—U.S. Department of Energy, Grand Junction Office, "Uranium Exploration Expenditures and Plans Survey," GJO-103 (Grand Junction, Colorado). **1980-1983 Actual, 1984 Planned**—Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983,* DOE/EIA-0402(83) (Washington, DC, July 1984). **1981 Planned**—Energy Information Administration, *1982 Survey of U.S. Uranium Exploration Activity,* DOE/EIA-0402(82) (Washington, DC, August 1983). **1984-1985 Actual, 1986 Planned**—Energy Information Administration, *Uranium Industry Annual 1985,* DOE/EIA-0478(85) (Washington, DC, November 1986). **1986 Actual, 1987 Planned**—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

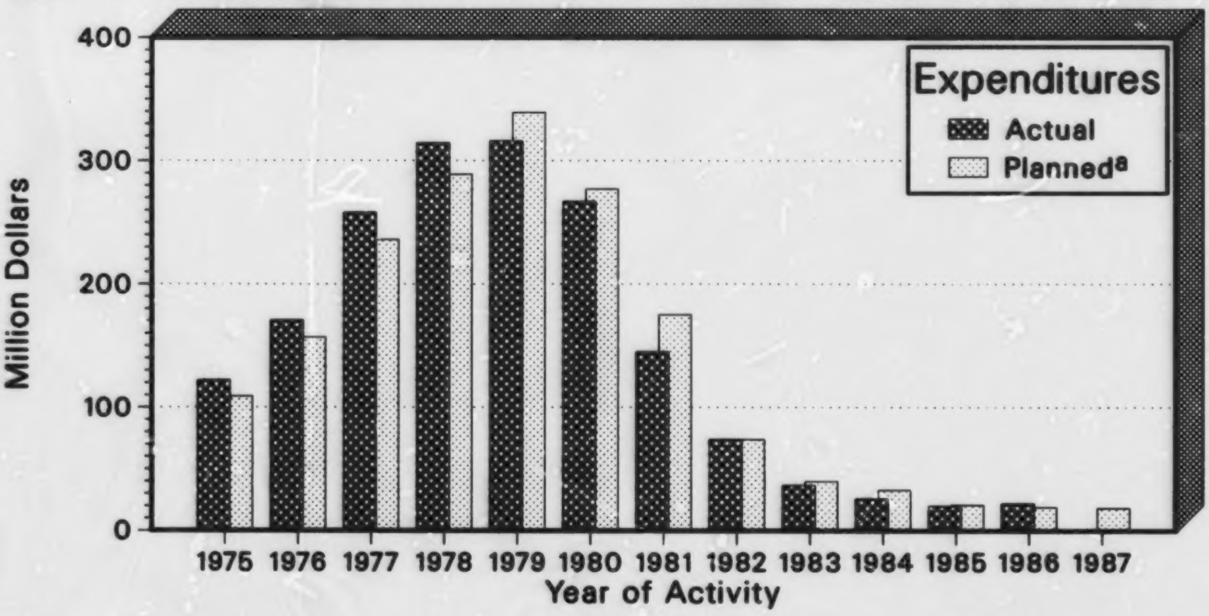
Figure 7. Comparison of Actual and Planned Surface Drilling Footage, 1975-1987



[a] Planned footages are reported at the end of the survey year for the following year.

Sources: •1975–1979: U.S. Department of Energy, Grand Junction Area Office, Uranium Exploration Expenditures and Plans Survey, GJO–103 (Grand Junction, Colorado, 1976–1980). •1980–1987: See Table 8.

Figure 8. Comparison of Actual and Planned Exploration Expenditures, 1975-1987



[a] Planned expenditures are reported at the end of the survey year for the following year.

Sources: •1975–1979: U.S. Department of Energy, Grand Junction Area Office, Uranium Exploration Expenditures and Plans Survey, GJO–103 (Grand Junction, Colorado, 1976–1980). •1980–1987: See Table 8.

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Solution Mining Production Drilling

Data on solution mining production drilling for the years 1976-1986 are shown in Table 9. This type of drilling is not a uranium exploration activity. The data have been collected in the annual surveys to obtain complete data on each category of surface drilling done by the uranium industry. Solution mining production drilling is done solely to recover uranium from ore in place, using *in situ* leaching methods. This drilling is done after the initial development drilling, in which the size, grade, and configuration of the uranium deposit are determined. For solution mining, injection and production holes are drilled in an *in situ* well field, and monitor wells are drilled around the periphery of the well field.

During 1986, solution mining production drilling was done in Nebraska, Texas, and Wyoming. The total footage reported for solution mining production drilling in 1986 was about 265,000 feet, a decrease of about 11 percent from the total footage drilled in 1985. Footages of solution mining production drilling for the years 1976 through 1986 are shown in Figure 9.

Costs of solution mining production drilling, expressed as both total cost and average cost per foot drilled, are shown in Table 9 and Figure 10. The reported 1986 total cost of solution mining production drilling decreased by about 10 percent from the total cost reported for 1985. The average cost per foot of solution mining production drilling remained nearly constant, increasing from $4.61 per foot drilled in 1985 to $4.64 per foot in 1986. The average drilling cost of $15.10 per foot reported for 1984 reflected the higher than average drilling cost reported by a single company.

Table 9. Solution Mining Production Drilling, 1976-1986

Year	Number of Companies	Number of Holes Drilled	Drilling Footage (thousand feet)	Percent Change From Prior Year	Cost (million dollars)	Percent Change From Prior Year	Average Cost (dollars per foot)
1976	10	(a)	350	--	1.83	--	5.23
1977	7	(a)	625	78.6	3.17	73.2	5.07
1978	14	(a)	2,035	225.6	11.36	258.4	5.58
1979	16	(a)	2,305	13.3	14.32	26.1	6.21
1980	19	(a)	2,326	.9	11.81	-17.5	5.08
1981	13	(a)	1,001	-57.0	12.49	5.8	12.48
1982	10	1,150	577	-42.4	4.51	-63.9	7.82
1983	7	941	336	-41.8	2.08	-53.9	6.20
1984	6	368	153	-54.5	2.31	11.1	[b] 15.10
1985	5	597	298	94.8	1.37	-40.7	4.61
1986	4	599	265	-10.9	1.23	-10.3	4.64

[a] Data were not collected.

[b] This increase reflects the higher than average drilling cost reported by one company during 1984.

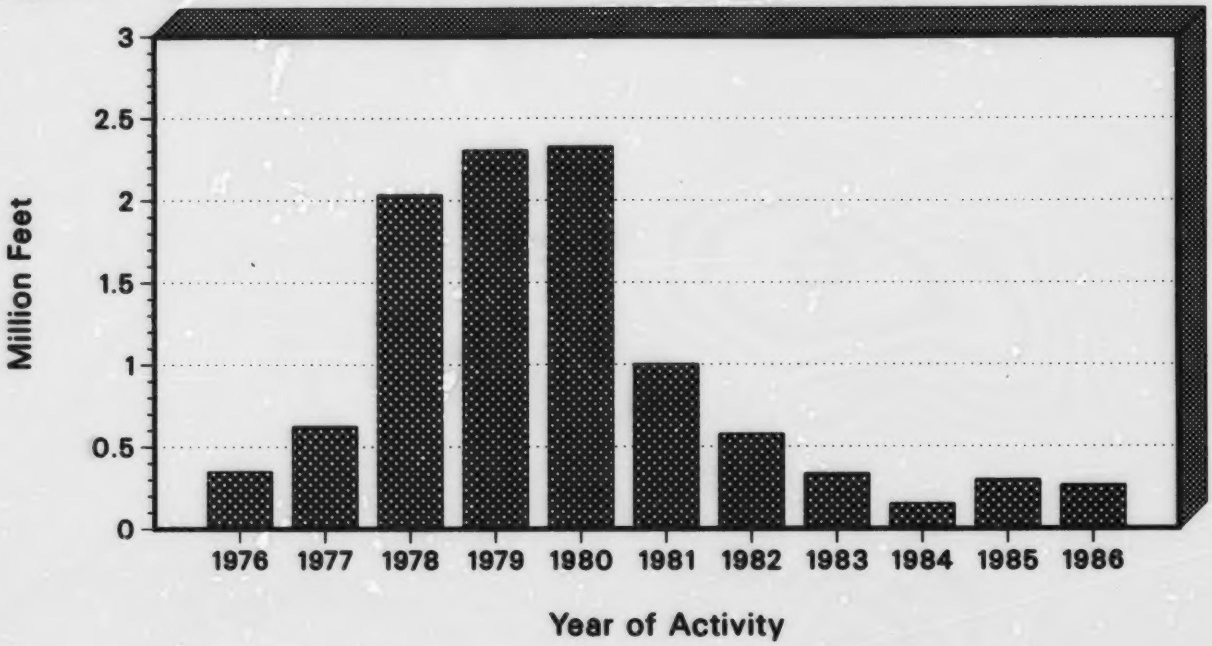
--, Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Note: Average cost per foot shown here may not equal quotients obtained with independently rounded numerator and denominator.

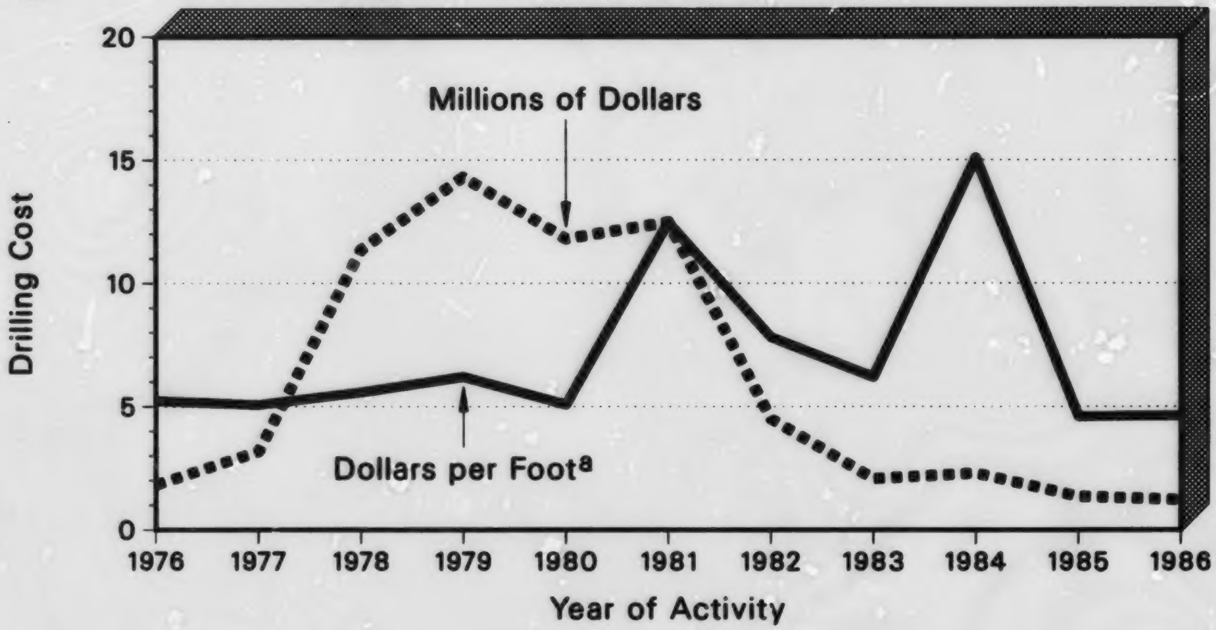
Sources: **1976-1980**--U.S. Department of Energy, Grand Junction Area Office, *Uranium Exploration Expenditures in 1981 and Plans for 1982-1983*, GJO-103(82) (Grand Junction, Colorado, July 1982). **1981-1983**--Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 9. Solution Mining Production Drilling Footage, 1976-1986



Source: See Table 9.

Figure 10. Solution Mining Production Drilling Costs, 1976-1986



[a] The 1984 increase in average drilling cost reflects the above average drilling cost of one company.

Source: See Table 9.

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Undiscovered Resources

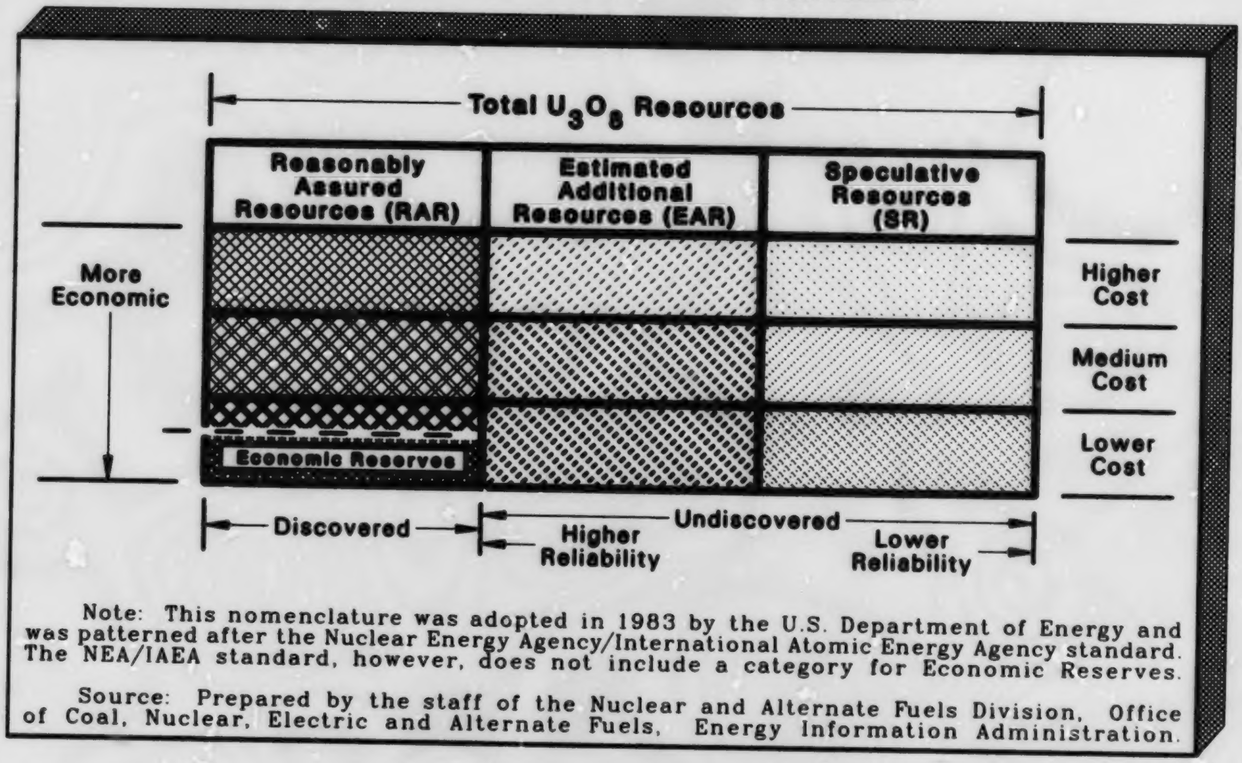
Estimates of Undiscovered Resources

This section presents historical and current data on estimates of undiscovered resources of uranium made by the Department of Energy and its predecessor agencies. The 1986 estimates of undiscovered resources are reported for the resource categories of Estimated Additional Resources (EAR) and Speculative Resources (SR), as explained in the following section. These estimates represent the portions of undiscovered resources of uranium that could be produced with the application of current technology at the specified forward-cost categories. For each forward-cost category of undiscovered resources, the estimates of resources at each cost level are cumulative and include all lower-cost resources within that category (Figure 11).

Estimates of Undiscovered Resources, 1965 Through 1973

Initial estimates of undiscovered resources made by the U.S. Department of Energy (DOE) before 1974 were based on results of studies of geologically favorable environments in the western United States, primarily in established mining districts. These estimates were made using a methodology that yielded point estimates without associated probability distributions, and the estimates were assigned to a single class of resources. Because this methodology was used for the estimates of U.S. undiscovered uranium resources made before 1974, those estimates are not strictly comparable with estimates made later. The estimates of undiscovered resources made for the years 1965 through 1973 are shown in Table 10.

Figure 11. U.S. Uranium Resource Classification Nomenclature


Total U_3O_8 Resources
Reasonably Assured Resources (RAR)
Estimated Additional Resources (EAR)
Speculative Resources (SR)
More Economic
Economic Reserves
Higher Cost
Medium Cost
Lower Cost
Discovered
Undiscovered
Higher Reliability
Lower Reliability

Note: This nomenclature was adopted in 1983 by the U.S. Department of Energy and was patterned after the Nuclear Energy Agency/International Atomic Energy Agency standard. The NEA/IAEA standard, however, does not include a category for Economic Reserves.

Source: Prepared by the staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration.

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Categories of Undiscovered Resources, 1974 Through 1986

During the period January 1974 through September 1983, the Atomic Energy Commission (AEC), the Energy Research and Development Administration (ERDA), and the DOE conducted the National Uranium Resource Evaluation (NURE) program to appraise the uranium resources in favorable geological settings throughout the United States. Estimates of undiscovered resources made for the years 1974-1982 were reported for three resource classes to aid in describing and categorizing resources across the wide variety of geological environments investigated during the nationwide program. The three classes of undiscovered resources used during the NURE program were Probable Potential, Possible Potential, and Speculative Potential Resources. The methodology developed by the DOE during the NURE program, which was used to derive estimates of undiscovered resources during the period 1974 through 1986, is described in Appendix B.

Estimates of undiscovered U.S. resources for the years 1983 through 1986 are reported by the EIA[3] using the categories for such resources published jointly by the Organization for Economic Cooperation and Development's Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA)[4] (Figure 11). These categories are Estimated Additional Resources (EAR) and Speculative Resources (SR). The NEA/IAEA classification scheme also includes the category of Reasonably Assured Resources (RAR). The full NEA/IAEA classification system was created to permit reporting of uranium resources in separate categories that reflect different levels of confidence in the quantities reported. Definitions for these NEA/IAEA resource categories appear in the Glossary. Figure 12 shows the approximate relationships between the categories of uranium resources that comprise the classification nomenclatures developed under the NURE program and that currently used by the EIA for U.S. resources.

Table 10. Potential Uranium Resources at the End of the Year, 1965-1973
(Million Pounds U_3O_8)

Year	Forward-Cost Category[a]			
	$8/lb	$10/lb	$15/lb	$30/lb
1965	(b)	650	1,050	1,330
1966	(c)	(c)	(c)	(c)
1967	490	700	1,140	2,000
1968	(c)	(c)	(c)	(c)
1969	770	1,200	1,920	3,200
1970	980	1,360	2,080	3,200
1971	920	1,300	2,000	3,200
1972	900	1,400	2,000	3,200
1973	900	1,400	2,000	3,200

[a] See Glossary for definition of forward cost.

[b] Not estimated at this forward cost.

[c] No estimates were made for the end of years 1966 and 1968. Potential resources at forward costs above $30/lb U_3O_8 were not estimated prior to 1977.

Source: U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983).

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[3] U.S. Department of Energy, *United States Uranium Mining and Milling Industry: A Comprehensive Review*, DOE/S-0028 (Washington, DC, May 1984), p. 17; U.S. Department of Energy, *Domestic Uranium Mining and Milling Industry: 1983 Viability Assessment*, DOE/S-0033 (Washington, DC, December 1984), p. 16; Energy Information Administration, *Domestic Uranium Mining and Milling Industry: 1984 Viability Assessment*, DOE/EIA-0477 (Washington, DC, September 1985), p. 16; Energy Information Administration, *Uranium Industry Annual 1984*, DOE/EIA-0478(84) (Washington, DC, October 1985), p. 27; Energy Information Administration, *Domestic Uranium Mining and Milling Industry: 1985 Viability Assessment*, DOE/EIA-0477 (Washington, DC, November 1986), p. 13; Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986), p. 24.

[4] Organization for Economic Cooperation and Development, Nuclear Energy Agency, and International Atomic Energy Agency, *Uranium: Resources, Production and Demand* (Paris, France, 1986), p.12.

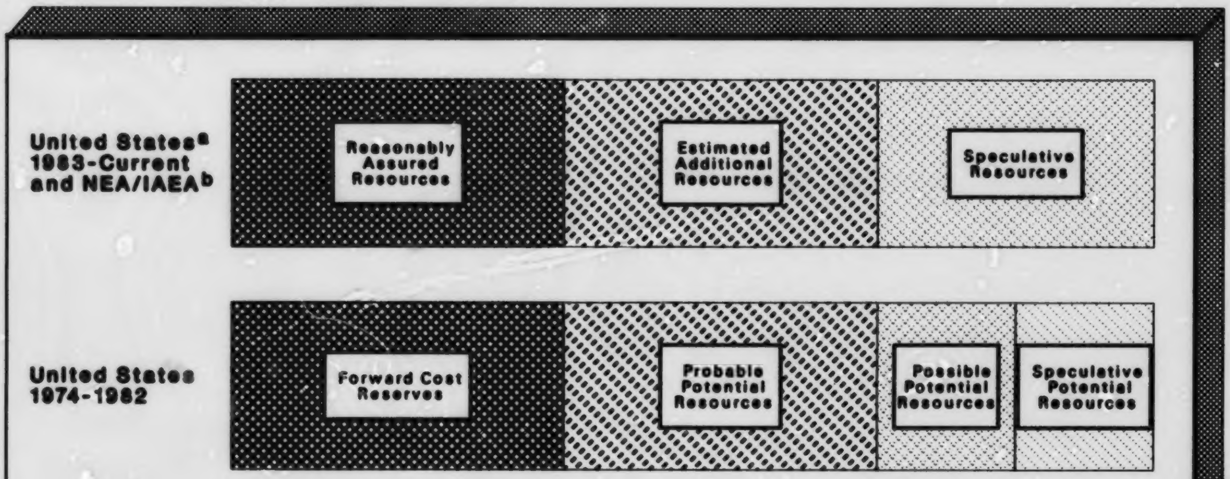
Estimated Additional Resources (EAR) and Speculative Resources (SR)

The estimates of EAR and SR presented in this section are developed from a data base of information on uranium deposits and extraction economics compiled during the past three decades of Government and industry activities. This data base includes the extensive data compiled during the NURE program. Estimates of these resources in the United States, shown in Table 11, represent the sum of mean expected values of the distributions of estimates for all areas assessed under the NURE program. The amounts of undiscovered resources reported for 1986 are unchanged from the 1985 values, because new data were not available that warranted changing the estimates.

Distribution of EAR and SR by Resource Region

Estimates of EAR and SR for the United States are reported for resource regions defined by geologic and physiographic characteristics. The mean values of EAR and SR are summarized by resource region and forward-cost category in Table 12. The DOE resource regions for the United States are shown in Figure 13.

Figure 12. Comparison of Historical and Current United States and NEA/IAEA Uranium Resources Classification Nomenclatures


United States[a] 1983-Current and NEA/IAEA[b]
Reasonably Assured Resources
Estimated Additional Resources
Speculative Resources
United States 1974-1982
Forward Cost Reserves
Probable Potential Resources
Possible Potential Resources
Speculative Potential Resources

[a] The two classifications shown are not strictly comparable, because the criteria used in the two systems are not identical. Precise correlations are not possible, particularly for the less assured resources. Nonetheless, based on the principal criterion of geological assurance of existence, this figure presents a reasonable approximation of uranium resource classification comparability.

[b] NEA/IAEA: Nuclear Energy Agency/International Atomic Energy Agency.

Source: Prepared by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration.

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Table 11. Estimated Additional Resource (EAR) and Speculative Resources (SR) at the End of the Year, 1974-1986
(Million Pounds U_3O_8)

Year	Forward-Cost Category[a]									
	$10/lb		$15/lb		$30/lb		$50/lb		$100/lb	
	EAR	SR	EAR	SR	EAR	SR	EAR	SR	EAR	SR
1974	900	1,000	1,400	1,700	2,300	3,500	(b)	(b)	(b)	(b)
1975	900	1,100	1,300	1,900	2,100	3,700	(b)	(b)	(b)	(b)
1976	600	400	1,200	1,400	2,200	3,200	2,700	3,900	(b)	(b)
1977	(b)	(b)	1,100	1,300	2,000	3,100	2,800	4,200	(b)	(b)
1978	(b)	(b)	800	600	2,000	2,000	3,000	3,400	(b)	(b)
1979[c]	(b)	(b)	800	600	2,000	2,000	3,000	3,400	(b)	(b)
1980	(b)	(b)	600	300	1,600	1,300	2,900	2,200	(b)	(b)
1981	(b)	(b)	(b)	(b)	1,200	900	2,200	1,800	4,200	3,400
1982	(b)	(b)	(b)	(b)	1,300	900	2,300	1,800	3,500	2,900
1983	(b)	(b)	(b)	(b)	1,300	1,000	2,400	2,000	3,800	3,000
1984	(b)	(b)	(b)	(b)	1,300	1,000	2,300	2,000	3,800	3,200
1985	(b)	(b)	(b)	(b)	1,300	1,000	2,400	1,900	3,700	3,200
1986	(b)	(b)	(b)	(b)	1,300	1,000	2,400	1,900	3,800	3,200

[a] Values shown are the mean values for the distributions of estimates for each forward-cost category, rounded to the nearest 100 million pounds U_3O_8.

[b] Not estimated for the indicated forward-cost category.

[c] No new estimates were released for the end of 1979, since the NURE program was to publish estimates of undiscovered resources by October 1980.

Sources: 1974-1982--U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983). 1983-1986--Estimates based on uranium resources data developed under the DOE National Uranium Resource Evaluation (NURE) program, 1974-1983, using methodology described in *An Assessment Report on Uranium in the United States of America*, GJO-111(80) (Grand Junction, Colorado, October 1980), and in U.S. Department of Energy, *Uranium Industry Seminar*, GJO-108(80) (Grand Junction, Colorado, October 1980).

Table 12. Estimated Additional Resources (EAR) and Speculative Resources (SR) by Resource Region at the End of 1986
(Million Pounds U_3O_8)

Resource Region	Forward-Cost Category[a]					
	$30/lb		$50/lb		$100/lb	
	EAR	SR	EAR	SR	EAR	SR
Colorado Plateau	480	190	900	470	1,400	870
Wyoming Basins	170	90	370	170	700	250
Coastal Plain	360	120	480	170	580	220
Northern Rockies	20	80	70	140	190	260
Colorado and Southern Rockies	140	90	180	140	220	190
Basin and Range	60	110	190	190	440	350
Other Regions[b]	110	360	180	660	260	1,040
Total	1,350	1,030	2,370	1,950	3,790	3,180

[a] Values shown are the mean values for the distributions of estimates for each forward-cost category, rounded to the nearest 10 million pounds U3O8.

[b] Includes Appalachian Highlands, Great Plains, Pacific Coast, Central Lowlands, and Southern Canadian Shield regions and Alaska.

Note: Totals may not equal sum of components due to independent rounding.

Source: Prepared by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on uranium resources data developed under the DOE National Uranium Resource Evaluation (NURE) program, using methodology described in *An Assessment Report on Uranium in the United States of America*, GJO-111(80) (Grand Junction, Colorado, October 1980), and in U.S. Department of Energy, *Uranium Industry Seminar*, GJO-108(80) (Grand Junction, Colorado, October 1980).

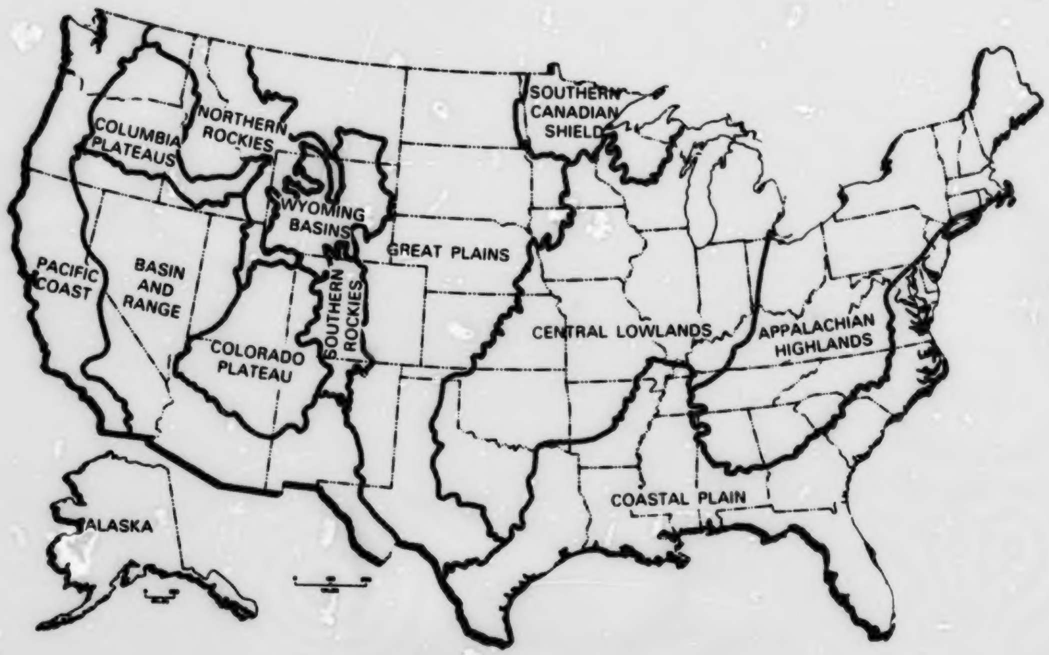
Distribution of Uranium Endowment by Resource Region

Uranium endowment is the total quantity of estimated resources, irrespective of economic considerations, above 0.01 percent U_3O_8 within geographic areas that have geologic characteristics favorable for uranium deposits. Endowment includes the undiscovered resources which are derived by determining economically recoverable portions of the endowment at stipulated maximum forward costs of producing the uranium. The distribution of the mean values of uranium endowment is shown by resource region in Table 13. (The source of the assessment methodology is noted at the end of the table.)

Distribution of EAR and SR by Land Status

The distribution by land status of mean values for $50 per pound EAR and SR at the end of 1986 is shown in Table 14.

Figure 13. Uranium Resource Regions of the United States


COLUMBIA PLATEAUS
NORTHERN ROCKIES
SOUTHERN CANADIAN SHIELD
WYOMING BASINS
GREAT PLAINS
PACIFIC COAST
BASIN AND RANGE
SOUTHERN ROCKIES
COLORADO PLATEAU
CENTRAL LOWLANDS
APPALACHIAN HIGHLANDS
COASTAL PLAIN
ALASKA

Source: U.S. Department of Energy, An Assessment Report on Uranium in the United States of America, JGO-111(80) (Grand Junction, Colorado, October 1980)

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Table 13. Uranium Endowment by Resource Region at the End of 1986
(Million Pounds U_3O_8)

Resource Region	Endowment Associated With Estimated Additional Resources[a]	Endowment Associated With Speculative Resources[a]
Colorado Plateau	2,320	1,910
Wyoming Basins	1,990	450
Coastal Plain	910	R410
Northern Rockies	R670	3,860
Colorado and Southern Rockies	320	360
Great Plains	310	850
Basin and Range	1,420	1,080
Central Lowlands	(b)	280
Appalachian Highlands	120	1,140
Other Regions[c]	50	120
Total	8,110	10,560

[a] Values shown are the mean values for the distributions of estimates of EAR and SR, rounded to the nearest 10 million pounds U_3O_8.

[b] No uranium endowment in the Estimated Additional Resources category is estimated for this resource region.

[c] Includes endowment associated with Estimated Additional Resources for Pacific Coast region and Alaska and endowment associated with Speculative Resources for Columbia Plateaus, Pacific Coast, and Southern Canadian Shield regions and Alaska.

R, Revised data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983). Estimates based on uranium resources data developed under the DOE National Uranium Resource Evaluation (NURE) program, using methodology described in *An Assessment Report on Uranium in the United States of America*, GJO-111(80) (Grand Junction, Colorado, October 1980), and in U.S. Department of Energy, *Uranium Industry Seminar*, GJO-108(80) (Grand Junction, Colorado, October 1980).

Table 14. Estimated Additional Resources (EAR) and Speculative Resources (SR) in the $50 per Pound Forward-Cost Category by Land Status at the End of 1986
(Million Pounds U_3O_8)

Land Status	Estimated Additional Resources[a]	Percent of Total EAR	Speculative Resources[a]	Percent of Total SR
Public Lands				
Bureau of Land Management and Forest Service Lands	540	22.7	280	14.2
Bureau of Reclamation	(b)	(c)	(b)	.2
Wilderness Areas	20	.7	20	1.0
National Park Service Lands	30	1.2	10	.5
Wildlife Refuges	(b)	(c)	(b)	.1
DOE-Administered	10	.3	(b)	(c)
Indian Lands	170	7.1	230	11.9
State Lands	80	3.2	70	3.7
Private Fee Lands[d]	1,460	61.8	1,270	65.4
Other (Military Reservations, Waterways, Reclamation Projects, Proposed Withdrawals, etc.)	70	2.9	60	2.9
Total	2,370	100.0	1,950	100.0

[a] Values shown are the mean values for the distributions of estimates of EAR and SR, rounded to the nearest 10 million pounds U_3O_8.

[b] Value is less than 10 million pounds U_3O_8.

[c] Value is less than 0.1 percent.

[d] Includes railroad lands and patented claims.

Note: Totals may not equal sum of components due to independent rounding.

Source: Prepared by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on uranium resources data developed under the DOE National Uranium Resource Evaluation (NURE) program, using methodology described in *An Assessment Report on Uranium in the United States of America*, GJO-111(80) (Grand Junction, Colorado, October 1980), and in U.S. Department of Energy, *Uranium Industry Seminar*, GJO-108(80) (Grand Junction, Colorado, October 1980).

Discovered Resources

Prior to 1984, it was the practice of the U.S. Government, through the Department of Energy's Grand Junction Project Office, to make independent assessments of Reasonably Assured Resources (RAR) of uranium on the basis of industry-supplied basic data. Since the closing of the uranium resource assessment program at the Grand Junction Project Office in 1983, the industry has been requested to report estimates of domestic Economic Reserves to the Energy Information Administration (EIA). For 1984, 1985, and 1986, Economic Reserves data were collected on Form EIA-858, "Uranium Industry Annual Survey."

The EIA categorizes domestic discovered uranium resources as Economic Reserves and Reasonably Assured Resources. The resource categories are discussed below.

Reasonably Assured Resources (RAR)

Estimates of RAR are shown in Tables 15 and 16. The estimate of RAR at $30 per pound U_3O_8 for the end of 1986 was 322 million pounds, a decrease of 23 million pounds from the previous year's estimate of 345 million pounds U_3O_8. The $50 per pound RAR estimate of 1,036 million pounds U_3O_8 represents a decrease of 36 million pounds from the previous year. The $100 per pound RAR estimate decreased from 1,675 million pounds U_3O_8 at the end of 1985 to 1,630 million pounds at the end of 1986.

The 1986 values for RAR shown in Tables 15 and 16 are the estimates at the end of 1986 with adjustments for mined-out properties and for production and associated depletion from 31 properties. The depletion for 1986 include erosions of 2.5, 5.8, and 8.3 million pounds U_3O_8 in the $30 per pound, $50 per pound, and $100 per pound forward-cost categories, respectively. Erosion is the reduction in the left-in-place quantity of estimated recoverable resources as a result of the mining of lower-cost reserves. A portion or all of the remaining reserves, estimated at a given cost and mining method, can be rendered unrecoverable at that cost because of erosion.

Estimates of RAR by State and expected mining method are shown in Table 17 and Figures 14 and 15. The distributions by forward-cost category of estimates of RAR as of the end of the year for 1964 through 1986 are shown in Figure 16.

Economic Reserves

The category of domestic Economic Reserves, a subcategory of RAR, is defined as uranium ore in known mineral deposits of such size, grade, and configuration that the ore reasonably can be expected to be recoverable at or below specified production costs with currently proven mining and processing technology and under current regulations. Estimates of the quantities of uranium, ore grades, and deposit configurations are based on sample data, measurements of the deposits, and knowledge of the deposit characteristics. Economic Reserves are generally those reserves with the highest probability of occurrence (known as discovered reserves, proven reserves, or ore reserves) that are recoverable at a profit, based on either current contracts or current market conditions.

Economic Reserves reported for 1986 by the uranium industry are summarized by State and by mining method in Table 18. The reported totals are aggregates of reserves determined separately for each property, based on company-specific criteria. Such criteria include the perception that the amount of uranium could be recovered at costs equal to or less than the prevailing market price or at a price specified in an existing contract. As such, Economic Reserves cited by the companies are reserves over a range of costs arising from various economic determinants at the individual company level.

Economic Reserves data for 1986 were reported for 58 properties, of which 30 were for underground mining, 21 were for *in situ* leach mining, 6 were for openpit mining, and 1 was for heap leach operations. In comparison, of the Economic Reserves data reported for 63 properties in 1985, 32 were for underground mining, 22 were for *in situ* mining, 7 were for openpit mining, and 2 were for heap leaching operations.

In 1986, U.S. Economic Reserves reported by 27 companies increased to about 318 million pounds U_3O_8, as compared to 229 million pounds reported by 19 companies in 1985 (Table 19). The increase resulted from reevaluations of properties on the basis of additional drilling data and from the application of different mining methods or combinations of methods. Several uranium properties were acquired by different companies in 1986, and this resulted in reevaluations of Economic Reserves. The resumption of mining at a few mines that were closed down in 1985 resulted in the reporting of Economic Reserves for those properties in the 1986 survey. Also, the write-downs of assets during the last several years has changed the economics of many properties. About 80 percent of the 1986 Economic Reserves reported by domestic companies were estimated in 1986, while 20 percent were estimated in the period 1981 through 1985.

Table 15. Reasonably Assured Resources at the End of the Year, 1947-1986
(Million Pounds U_3O_8)

Year	Forward-Cost Category in Nominal Dollars				
	$8/lb	$15/lb	$30/lb	$50/lb	$100/lb
1947	4	(a)	(a)	(a)	(a)
1948	4	(a)	(a)	(a)	(a)
1949	4	(a)	(a)	(a)	(a)
1950	6	(a)	(a)	(a)	(a)
1951	12	(a)	(a)	(a)	(a)
1952	15	(a)	(a)	(a)	(a)
1953	30	(a)	(a)	(a)	(a)
1954	55	(a)	(a)	(a)	(a)
1955	135	(a)	(a)	(a)	(a)
1956	240	(a)	(a)	(a)	(a)
1957	333	(a)	(a)	(a)	(a)
1958	364	(a)	(a)	(a)	(a)
1959	394	(a)	(a)	(a)	(a)
1960	374	(a)	(a)	(a)	(a)
1961	348	(a)	(a)	(a)	(a)
1962	332	(a)	(a)	(a)	(a)
1963	320	(a)	(a)	(a)	(a)
1964	302	(a)	(a)	(a)	(a)
1965	290	(a)	(a)	(a)	(a)
1966	282	(a)	(a)	(a)	(a)
1967	296	496	(a)	(a)	(a)
1968	322	530	(a)	(a)	(a)
1969	408	634	(a)	(a)	(a)
1970	492	782	(a)	(a)	(a)
1971	546	1,040	(a)	(a)	(a)
1972	546	1,040	(a)	(a)	(a)
1973	554	1,040	1,268	(a)	(a)
1974	400	840	1,200	(a)	(a)
1975	(a)	860	1,280	(a)	(a)
1976	(a)	820	1,360	1,660	(a)
1977	(a)	740	1,360	1,780	(a)
1978	(a)	580	1,360	1,840	(a)
1979	(a)	450	1,290	1,872	2,244
1980	(a)	224	940	1,574	2,068
1981	(a)	(a)	410	1,188	1,788
1982	(a)	(a)	360	1,152	1,778
1983	(a)	(a)	360	1,140	1,770
1984	(a)	(a)	[b] 359	[b] 1,106	[b] 1,719
1985	(a)	(a)	[b] 345	[b] 1,072	[b] 1,675
1986	(a)	(a)	[b] 322	[b] 1,036	[b] 1,630

---

[a] Not estimated for the indicated forward-cost category.

[b] Does not include 55 million pounds of $30 per pound reserves from byproduct recovery facilities calculated by multiplying the capacity of byproduct plants as of December 31, 1986, by the number of years until the year 2000.

Sources: **1947-1963**–U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(78) (Grand Junction, Colorado, January 1978).**1964-1982**– U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983). **1983-1986**–Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Area Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1984, 1985, 1986).

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Table 16. Changes in Reasonably Assured Resources During 1986
(Million Pounds U_3O_8)

Item	Forward-Cost Category		
	$30/lb	$50/lb	$100/lb
Reasonably Assured Resources at the End of 1985	345	1,072	1,675
New Reasonably Assured Resources	0	0	0
Reevaluations			
Additions	0	0	0
Subtractions	-12	-22	-28
Depletion (Production and Erosion)	-11	-14	-17
Reasonably Assured Resources at the End of 1986[a]	322	1,036	1,630

[a] Does not include 55 million pounds of $30 per pound reserves from byproduct recovery facilities calculated by multiplying the capacity of byproduct plants as of December 31, 1986, by the number of years until the year 2000.

Source: Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Area Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986). See Appendix B for a description of the methodology.

Table 17. Reasonably Assured Resources by State and Mining Method at the End of 1986
(Million Pounds U_3O_8)

Item	Forward-Cost Category		
	$30/lb	$50/lb	$100/lb
State			
New Mexico	181	455	683
Wyoming	71	351	611
Texas	16	43	73
Arizona, Colorado, Utah	32	123	170
Others[a]	22	64	93
Total[b]	322	1,036	1,630
Mining Method			
Underground Mining	216	549	881
Openpit Mining	45	326	503
In Situ Leaching	61	143	222
Others[c]	1	18	24
Total[b]	322	1,036	1,630

[a] Includes California, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

[b] Does not include 55 million pounds of $30 per pound reserves from byproduct recovery facilities calculated by multiplying the capacity of byproduct plants as of December 31, 1986, by the number of years to the year 2000.

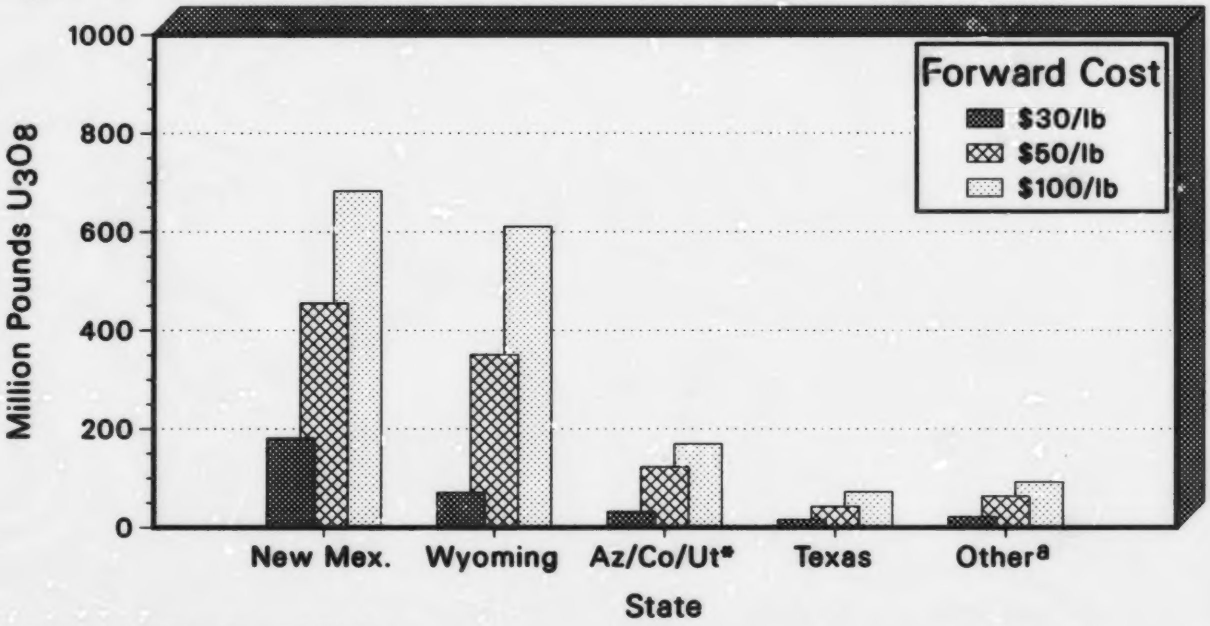
[c] Includes heap leaching, vat leaching, mine water, and low-grade stockpiles.

Note: Estimation of RAR is an adjustment of 1983 RAR that is based on evaluation of data on individual ore body (depth, thickness, size, shape, value of the ore, etc.), applicable extraction technology costs, and the nature of the ground containing the deposit.

Note: Totals may not equal sum of components due to independent rounding.

Source: Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, based on U.S. Department of Energy, Grand Junction Area Office data files and Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986). See Appendix B for a description of the methodology.

Figure 14. Reasonably Assured Resources (RAR) by State at the End of 1986

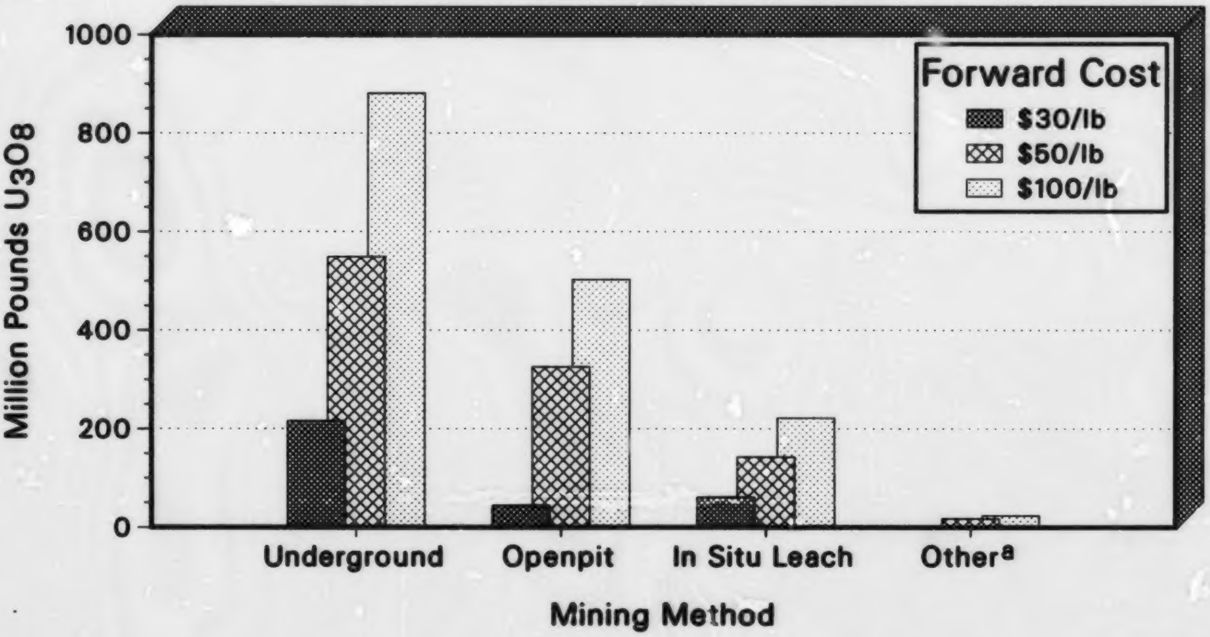


*Arizona, Colorado, and Utah.

[a] Other includes California, Idaho, Montana, Nebraska, Nevada, North Dakota, Scuth Dakota, Oregon, and Washington.

Source: See Table 17.

Figure 15. Reasonably Assured Resources by Mining Method at the End of 1986



[a] Other includes heap leaching, vat leaching, mine water, and low grade stockpiles.

Source: See Table 17.

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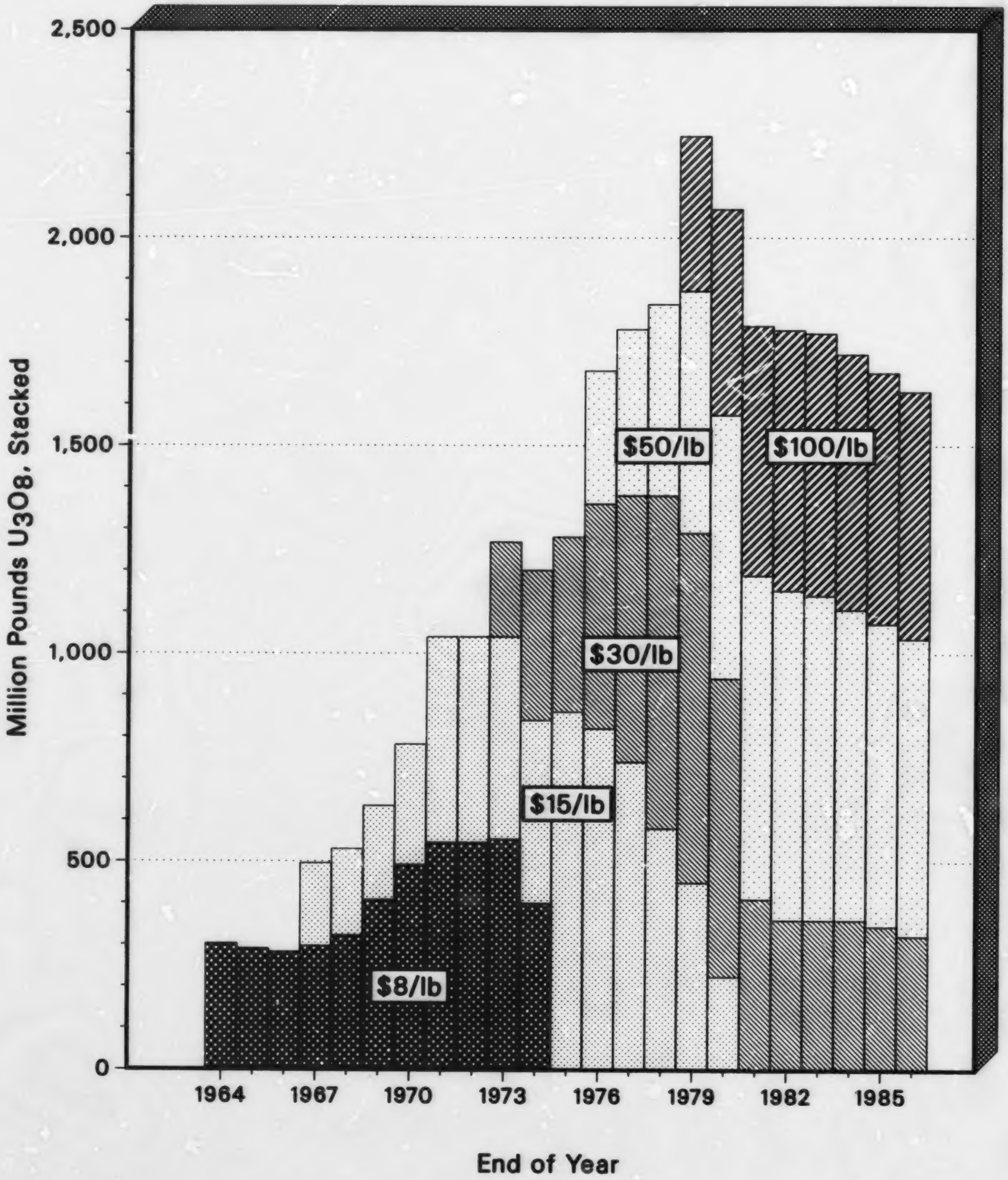
Figure 16. Reasonably Assured Resources by Forward-Cost Categories, 1964-1986



Source: See Table 15.

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Three States -- New Mexico, Texas, and Wyoming -- account for about 83 percent of the total Economic Reserves of 318 million pounds of U_3O_8. About 56 percent of the total is in Wyoming, where openpit mining is predominant.

Subeconomic Reserves

Subeconomic Reserves reported by 48 companies for 1986 increased to 643 million pounds U_3O_8, as compared to 629 million pounds U_3O_8 reported by 42 companies in 1986. Like Economic Reserves, Subeconomic Reserves are discovered resources, but they are not minable at a profit, based on current contract or market conditions at the time of evaluation. A comparison of Economic Reserves reported for 1984, 1985, and 1986 is presented in Table 19, along with the Subeconomic Reserves reported for 1985 and 1986.

Table 18. Economic Reserves by State and Mining Method as of December 31, 1986

(Million Pounds U_3O_8)

Item	Thousand Tons of Ore	Percent U_3O_8[a]	Million Pounds U_3O_8
State			
New Mexico	18,516	0.180	66.7
Wyoming	69,226	.129	178.4
Texas	13,684	.071	19.3
Others[b]	9,228	.292	53.8
Total[c]	110,654	.144	318.3
Mining Method			
Underground Mining	23,059	.308	142.0
Openpit Mining	14,801	.100	29.7
Others[d]	72,794	.101	146.6
Total[c]	110,654	.144	318.3

[a] Weighted average.
[b] Includes Arizona, Colorado, Nebraska, and Utah.
[c] Does not include economic reserves from byproduct recovery facilities.
[d] Includes *in situ* leaching, heap leaching, and other leaching.

Note: The mining method for Ecomonic Reserves is reported by uranium mining companies on Form EIA-858.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 19. Comparison of Economic and Subeconomic Uranium Reserves, 1984, 1985, and 1986

Category	Economic Reserves			Subeconomic Reserves		
	Million Tons of ore	Percent U_3O_8	Million Pounds U_3O_8	Million Tons of ore	Percent U_3O_8	Million Pounds U_3O_8
1984	67.6	0.147	199.1	(b)	(b)	(b)
1985	87.8	.131	229.2	258.6	0.122	629.2
1986	110.7	.144	318.3	278.7	.115	643.3

[a] Weighted average.
[b] Data were not collected.

Sources: 1984-1985--Energy Information Administration, *Uranium Industry Annual 1985*, 1986--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Mine Production of Uranium

Table 20 shows mine production of uranium by mining method from 1976 through 1986. In 1986, annual mine production of uranium from underground mines increased for the first year since 1980 to 6.4 million pounds U_3O_8. The amount of uranium produced by *in situ* leaching and other nonconventional methods declined in the period 1981-1986. Production of uranium from byproduct sources is not included in Table 20.

The mine production of uranium by State is shown in Figure 17, and a history of mine production of uranium by State is presented in Table 21 and Figure 18. The 1986 mine production of uranium by mining method is also shown in Figure 17. Table 22 shows the number of mining sources operating each year from 1981 through 1986.

Table 20. Mine Production of Uranium by Mining Method, 1976-1986

Mining Method	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Underground Mines											
Million Pounds U_3O_8	13.4	16.6	18.4	12.6	19.2	17.0	12.6	(a)	4.9	4.5	6.4
Percent of Total	47.9	49.7	45.5	30.4	R43.2	R46.4	R53.4	--	R49.0	52.3	77.8
Openpit Mines											
Million Pounds U_3O_8	13.6	15.2	19.2	18.8	20.8	14.0	7.6	(a)	2.9	2.0	W
Percent of Total	48.6	45.5	47.5	45.4	R46.8	R38.3	R32.2	--	R29.0	23.3	W
Other[b]											
Million Pounds U_3O_8	1.0	1.6	2.8	10.0	R4.4	R5.6	R3.4	4.9	R2.2	2.1	1.8
Percent of Total	3.6	4.8	6.9	24.2	R9.9	R15.3	R14.4	20.9	R22.0	24.4	22.2
Total Production											
Million Pounds U_3O_8	28.0	33.4	40.4	41.4	R44.4	R36.6	R23.6	23.5	R10.0	8.6	8.3
Percent Change From Prior Year	--	19.3	21.0	2.5	R7.2	R-17.6	R-35.6	R-0.4	R-57.4	R-14.0	-3.5

[a] For 1983, open pit plus underground mine production was 18.6 million pounds U_3O_8, or 79.1 percent.

[b] For 1976-1984, the "Other" category includes production from *in situ* leach, heap leach, mine water, and low-grade stockpiles. For 1985 the "Other" includes includes production from *in situ* leach, mine water, and water-treatment plant solutions. For 1986, the "Other" includes production from openpit, *in situ* leach, heap leach, mine water, and water-treatment plant solutions.

R, Revised data.

--, Not applicable.

W, Withheld to avoid disclosure of company-specific data.

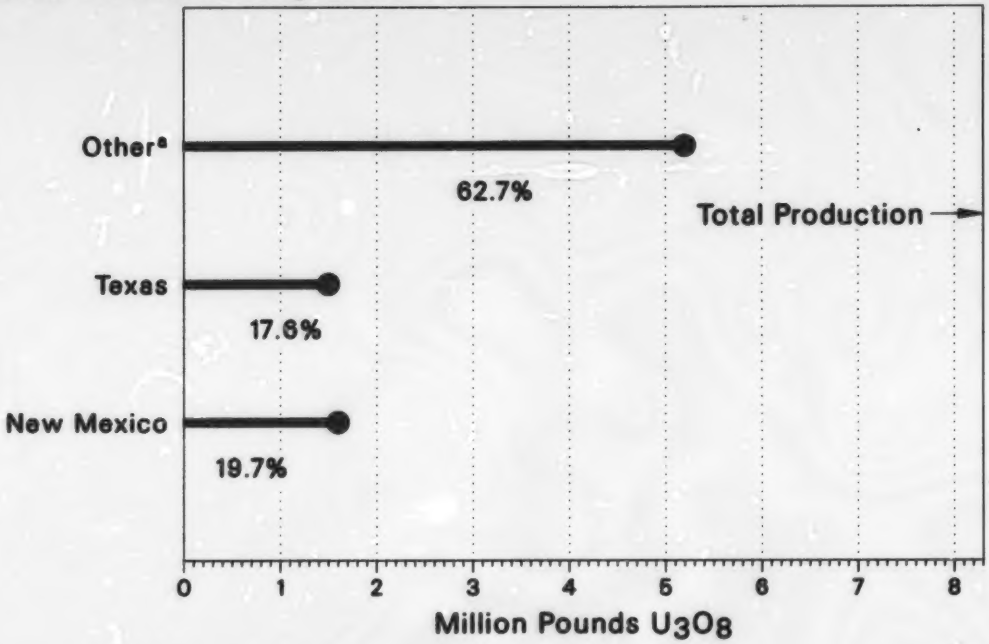
Note: Totals may not equal sum of components due to independent rounding.

Note: Percentages were calculated using unrounded data.

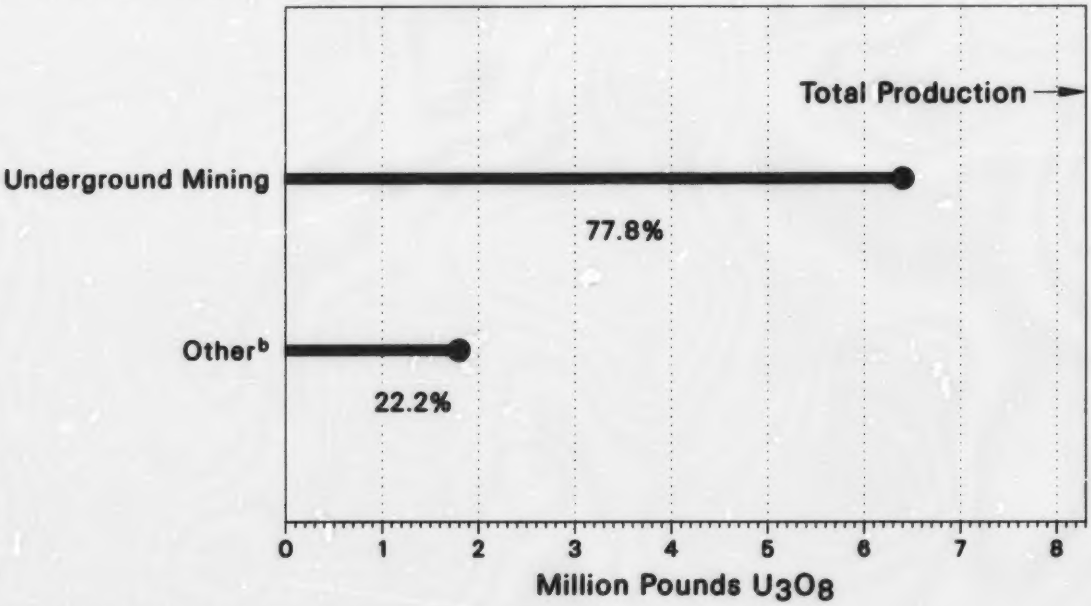
Sources: **1976-1982**--U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry,* GJO-100 (Grand Junction, Colorado, January 1983). **1983**--Calculated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985,* DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 17. Mine Production of Uranium by State and by Mining Method in 1986

Production of Uranium by State



Production by Mining Method



[a] Includes Arizona, Colorado, Utah, and Wyoming.

[b] Includes openpit, in situ leach, heap leach, mine water, and water–treatment plant solutions.

Sources: See Tables 20 and 21.

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The quantities of uranium ore produced from openpit and underground mines and received at mills, buying stations, and stockpiles in 1986 are shown in Table 23, along with similar historical data for 1948 through 1985. The table does not include production primarily from mine water, *in situ* leach, heap leach solution, byproduct recovery, or miscellaneous low-grade ore from old mine dumps for 1948 through 1983.

Table 21. Mine Production of Uranium by State, 1968-1986
(Million Pounds U_3O_8)

Year	Colorado	New Mexico	Texas	Utah	Wyoming	Others[a]	Total
1968	2.9	12.9	1.2	1.8	6.3	0.6	25.7
1969	3.0	12.4	(b)	1.2	7.1	1.4	25.2
1970	3.1	12.1	(b)	1.7	6.8	2.4	26.1
1971	2.6	10.9	(b)	1.7	7.3	3.6	26.2
1972	2.0	11.4	(b)	1.6	9.1	3.5	27.7
1973	2.0	10.0	(b)	2.1	10.7	2.7	R27.6
1974	(b)	10.8	(b)	(b)	8.0	6.4	25.2
1975	(b)	11.0	(b)	(b)	7.4	6.2	24.6
1976	(b)	13.0	(b)	(b)	8.8	6.2	28.0
1977	(b)	15.2	(b)	(b)	10.4	7.8	33.4
1978	(b)	18.8	(b)	(b)	11.0	10.6	40.4
1979	(b)	16.4	(b)	(b)	11.2	13.8	41.4
1980	(b)	16.4	7.0	(b)	12.8	R8.2	R44.4
1981	(b)	13.2	6.4	(b)	8.8	R8.2	R36.6
1982	(b)	7.6	4.4	(b)	5.4	R6.2	R23.6
1983	(b)	5.9	3.9	(b)	7.4	6.3	23.5
1984	(b)	3.0	2.7	(b)	1.9	R2.4	R10.0
1985	(b)	1.3	2.1	(b)	1.6	3.5	8.6
1986	(b)	1.6	1.5	(b)	(b)	5.2	8.3

[a] Includes, for various years, Alaska, Arizona, Colorado, North Dakota, South Dakota, Texas, Utah, Washington, and Wyoming.

[b] Data included in the "Others" category to avoid disclosure.

R, Revised data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1968-1982**–U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry,* GJO-100 (Grand Junction, Colorado, 1969-1983).**1983**–Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. **1984-1985**–Energy Information Administration, *Uranium Industry Annual 1985,* DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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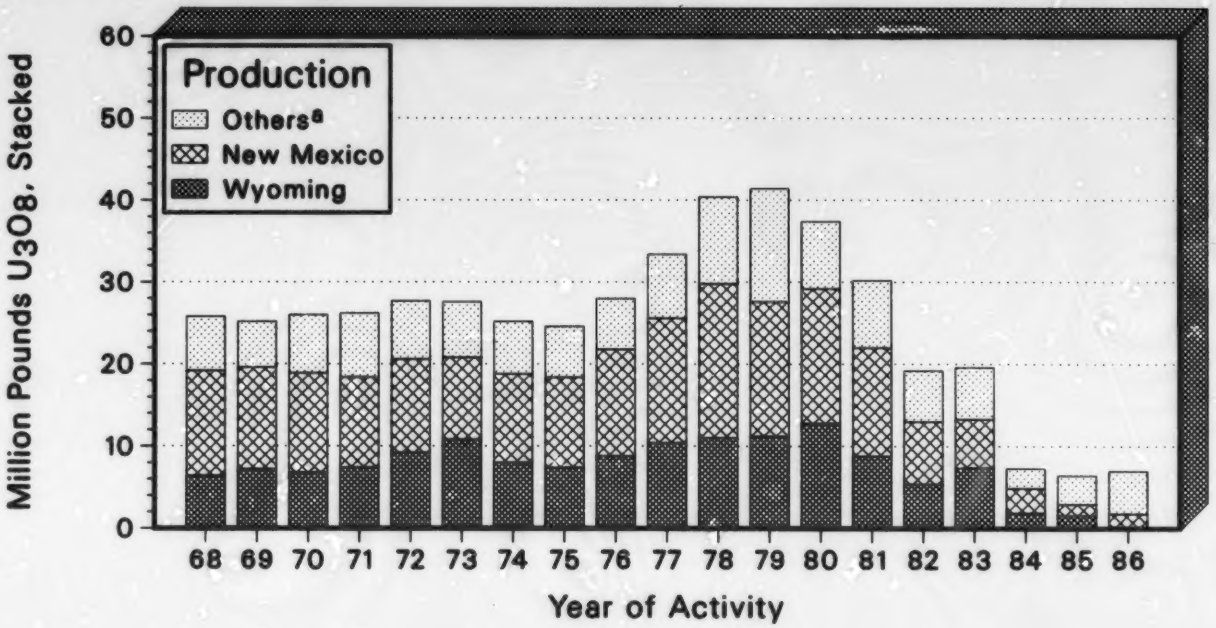
Figure 18. Mine Production of Uranium by State, 1968-1986



[a] Includes for various years Alaska, Arizona, Colorado, North Dakota, South Dakota, Texas, Utah, and Washington.

Source: See Table 21.

Table 22. Number of Uranium Mining Sources Operating During the Year, 1981-1986

Mining Method Used	1981	1982	1983	1984	1985	1986
Underground	167	139	94	19	13	13
Openpit	50	24	16	8	6	4
In Situ Leaching	14	18	10	14	10	12
Others (Heap Leach, Mine Water, Mill Tailings, and Low-Grade Stockpiles)	16	10	7	1	5	2
Total	R247	R191	R127	R42	R34	31

Note: Table was revised for 1981 through 1985 to delete byproduct sources.

R, Revised data.

Sources: 1981-1983–U.S. Department of Energy, Grand Junction Area Office, *Production Data File*. 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Table 23. Uranium Ore Produced From Mines and Received at Mills and Buying Stations, 1948-1986

Year	Openpit Mines		Underground Mines		Total Receipts		
	Thousand Tons of Ore	Million Pounds U_3O_8	Thousand Tons of Ore	Million Pounds U_3O_8	Thousand Tons of Ore	Million Pounds U_3O_8	Percent Change From Prior Year
1948	(a)	(b)	38	0.2	38	0.2	--
1949	1	(b)	172	1.0	173	1.0	400.0
1950	23	0.2	228	1.4	251	1.6	60.0
1951	28	.4	319	1.8	347	2.2	37.5
1952	65	.6	370	2.0	435	2.6	18.2
1953	179	1.2	555	3.4	734	4.6	76.9
1954	266	1.8	840	5.2	1,106	7.0	52.2
1955	374	1.6	1,150	7.2	1,524	8.8	25.7
1956	1,247	6.4	1,758	10.4	3,005	16.8	90.9
1957	1,613	6.8	2,082	12.8	3,695	19.6	16.7
1958	2,358	10.8	2,820	17.2	5,178	28.0	42.9
1959	2,206	8.8	4,792	26.0	6,935	34.8	24.3
1960	2,393	10.6	5,577	27.0	7,970	37.6	8.0
1961	2,482	10.6	5,559	26.4	8,041	37.0	-1.6
1962	1,782	8.6	5,271	25.6	7,053	34.2	-7.6
1963	1,879	8.8	4,069	20.6	5,948	29.4	-14.0
1964	1,537	6.8	3,760	21.0	5,297	27.8	-5.4
1965	1,243	6.0	3,133	14.8	4,376	20.8	-25.2
1966	1,333	6.2	2,996	13.6	4,329	19.8	-4.8
1967	1,593	6.4	3,697	15.0	5,272	21.4	8.1
1968	2,366	9.2	4,082	16.0	6,448	25.2	17.8
1969	2,173	10.4	3,731	14.2	5,904	24.6	-2.4
1970	2,801	11.8	3,523	13.8	6,324	25.6	4.1
1971	3,284	14.0	2,995	11.8	6,279	25.8	.8
1972	3,887	16.2	2,531	11.2	6,418	27.4	6.2
1973	4,544	17.2	1,993	10.0	6,537	27.2	-.7
1974	4,216	14.6	2,811	10.2	7,027	24.8	-8.8
1975	4,247	13.4	2,810	10.6	7,057	24.0	-3.2
1976	4,673	13.6	3,935	13.4	8,608	27.0	12.5
1977	5,578	15.2	4,747	16.6	10,325	31.8	17.8
1978	8,237	19.2	6,105	18.4	14,342	37.6	18.2
1979	9,655	18.8	5,356	12.6	15,011	31.4	-16.5
1980	10,394	20.8	6,351	19.2	16,745	40.0	27.4
1981	8,436	14.0	5,229	17.2	13,665	31.2	-22.0
1982	5,504	7.8	2,809	12.4	8,313	20.2	-35.3
1983	(c)	(c)	(c)	(c)	7,400	18.6	-7.9
1984	1,968	2.9	1,027	4.9	2,995	7.7	-58.6
1985	936	2.0	570	4.3	1,506	6.3	-18.2
1986	W	W	W	W	801	6.7	5.7

[a] Value is less than 1,000 tons.

[b] Value is less than 0.2 million pounds.

[c] For 1983, data for openpit and underground mine production totals were not reported separately.

W, Withheld to avoid disclosure of company-specific data.

--, Not applicable.

Note: Mined ore does not include primarily production from mine water, *in situ* leach, heap leach solutions, byproducts, or miscellaneous low-grade ore from old mine dumps.

Sources: **1948-1982**– U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry,* GJO-100(83) (Grand Junction, Colorado, January 1983). **1983**–Calculated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. **1984-1985**–Energy Information Administration, *Uranium Industry Annual 1985,* DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Production of Uranium Concentrate

Historical Data

Data on the annual production of uranium concentrate (U_3O_8) by State through 1986 are shown in Table 24. Utah was the largest concentrate producing state in 1986. Texas ranked second in production of uranium concentrate in 1986, with 19 percent of the total. Concentrate production in 1986 declined by 74 percent in Wyoming and 46 percent in New Mexico.

Since 1980, the peak year for uranium concentrate production in the United States, annual production across the domestic industry has declined by 69 percent. Among major uranium producing states, New Mexico, Wyoming, and Texas, annual concentrate production in both New Mexicoand Wyoming in 1986 as compared to 1980 has declined by 95 percent, and production in Texas has declined by 62 percent. Concentrate production in New Mexico and Wyoming historically has been largely from conventional mining and milling. In Texas, production of uranium concentrate since 1980 has been chiefly from *in situ* leaching operations, although in 1986 the milling of uranium ore from New Mexico contributed substantially to the total production for Texas. Concentrate production in Colorado and Utah has been primarily from conventional mining and milling. In 1986, most of the uranium ore processed in Utah was shipped from mines in Arizona.

With the exception of uranium production from Wyoming during 1973, New Mexico was the largest producer of U_3O_8 concentrate from 1966 through 1983, although its level of production and the percentage of the annual total production of U_3O_8 began to decline significantly in 1981. Production in Wyoming, the largest producer in 1984 and 1985, has declined each year since 1983.

Table 24. Uranium Concentrate Production by State, 1947-1986
(Million Pounds U_3O_8)

Year(s)	State						Total	Cumulative Total
	Colorado	New Mexico	Texas	Utah	Wyoming	Others[a]		
1947-1965	59.304	108.602	(b)	57.848	36.898	16.760	279.412	279.412
1966	2.848	10.152	(b)	(c)	4.496	3.684	21.178	300.590
1967	2.680	11.866	(b)	(c)	5.334	2.626	22.506	323.096
1968	3.228	12.384	(b)	(c)	5.746	3.378	24.736	347.832
1969	3.356	11.886	(b)	(c)	6.126	1.850	23.218	371.050
1970	(c)	11.542	(b)	(c)	7.308	6.960	25.810	396.860
1971	(c)	10.610	(b)	(c)	6.974	6.962	24.546	421.406
1972	(c)	10.928	(b)	(c)	8.432	6.440	25.800	447.206
1973	(c)	9.268	(b)	(c)	10.318	6.884	26.470	473.676
1974	(c)	9.902	(b)	(c)	7.534	5.620	23.056	496.732
1975	(c)	10.382	(c)	(c)	6.894	5.924	23.200	519.932
1976	(c)	12.118	(c)	(c)	8.092	5.284	25.494	545.426
1977	(c)	13.558	(c)	(c)	9.960	6.340	29.878	575.304
1978	(c)	17.078	(c)	(c)	10.658	9.236	36.972	612.276
1979	(c)	14.846	5.302	(c)	10.904	6.420	37.472	649.748
1980	(c)	15.502	6.816	(c)	12.072	9.314	43.704	693.452
1981	(c)	12.412	6.282	(c)	8.170	11.070	38.474	731.926
1982	(c)	7.812	4.262	(c)	5.042	9.752	26.868	758.794
1983	(c)	5.660	3.200	(c)	5.260	7.038	21.158	779.952
1984	(c)	2.916	2.620	(c)	3.120	6.226	[d] 14.882	794.834
1985	(c)	1.387	2.167	(c)	2.427	5.333	[d] 11.314	806.148
1986	(c)	.751	2.586	(c)	.633	9.536	[d] 13.506	819.654

[a] Includes, for various years, Arizona, Colorado, Florida, Louisiana, South Dakcta, Texas, Utah, and Washington.

[b] Data were not collected.

[c] Included in the "Others" category.

[d] Total does not include uranium concentrate production from pilot projects or other research project sources.

Sources: **1947-1982**--U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983). **1983**--Estimated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Uranium is also recovered in the United States as a byproduct of the production of wet-process phosphoric acid. Florida phosphate rock is the raw material used at plants in Florida and Louisiana to manufacture phosphoric acid. Since the startup of this byproduct U_3O_8 recovery industry in the United States in 1977, the annual share of domestic uranium concentrate production derived from the manufacture of wet-process phosphoric acid has increased each year through 1985. The total prouction of uranium conentrate as a byproduct of phosphate processing declined in 1986 by a modest amount.

Table 25 shows total U.S. production of uranium concentrate through 1986. The trend of decreasing concentrate production, which began in 1981, was continued in 1985 with a decrease to 11.3 million pounds U_3O_8. In 1986, however, uranium concentrate production increased to 13.5 million pounds --a rise of 19 percent over the 1985 production level. Nevertheless, the 1986 production was only 31 percent of the highest annual U.S. production level of 43.7 million pounds U_3O_8 recorded in 1980. Table 25 also shows data for processing-plant shipments of uranium concentrate from 1978 through 1986.

Table 25. Uranium Processing Operations, 1978-1986

Item	1978	1979	1980	1981	1982	1983	1984	1985	1986
Ore Fed to Process									
Thousand Tons of Ore	13,804	16,067	16,830	14,546	8,751	5,925	4,316	1,795	1,308
Percent U_3O_8 (weighted average)	.134	.113	.118	.115	.119	.128	.112	.161	.336
Million Pounds U_3O_8	36.865	36.313	39.863	33.384	20.761	15.180	9.631	5.785	8.783
Other Mill Feed[a] (million pounds U_3O_8)	.714	.779	.772	.678	.654	.573	.536	.750	.260
Total Mill Feed (million pounds U_3O_8)	37.579	37.092	40.635	34.062	21.416	15.752	10.168	6.535	9.043
Change in In-Process Inventory (million pounds U_3O_8)	-.256	.042	.046	.007	-.287	-.280	.048	.206	-.064
Production (million pounds U_3O_8)									
Theoretical Production at 100 Percent Recovery	37.835	37.050	40.589	34.055	21.702	16.032	10.119	6.329	9.107
Conventional Concentrate Production	34.343	33.753	37.805	31.996	20.893	15.519	9.626	6.084	8.853
U_3O_8 Remaining in Mill Tailings	3.491	3.297	2.785	2.059	.809	.514	.493	[b] .245	[c] .254
Recovery From Mill Feed (percent)	90.8	91.1	93.1	94.0	96.3	96.8	95.1	96.1	97.2
Other Concentrate Production[d]	2.629	3.719	5.900	6.477	5.975	5.639	5.256	5.230	4.653
Total Concentrate Production	36.972	37.472	43.704	38.474	26.868	21.158	[e] 14.882	[e] 11.314	[e] 13.506
Concentrate Shipments (million pounds U_3O_8)	36.555	37.081	44.746	35.148	26.480	19.755	15.485	11.760	10.641

[a] Includes uranium recovered from low-grade ore, mine water, tailings water, and heap leaching, except as footnoted below.

[b] Excludes 0.107 million pounds of uranium as unaccountable.

[c] Excludes 0.008 million pounds of uranium as unaccountable.

[d] Saleable U_3O_8 concentrate obtained from *in situ* leaching and as a byproduct of other processing. The total for 1986 includes U_3O_8 obtained from mine water at some mills that did not report processing of uranium ore in 1986.

[e] Total does not include uranium concentrate production from pilot projects or other research project sources.

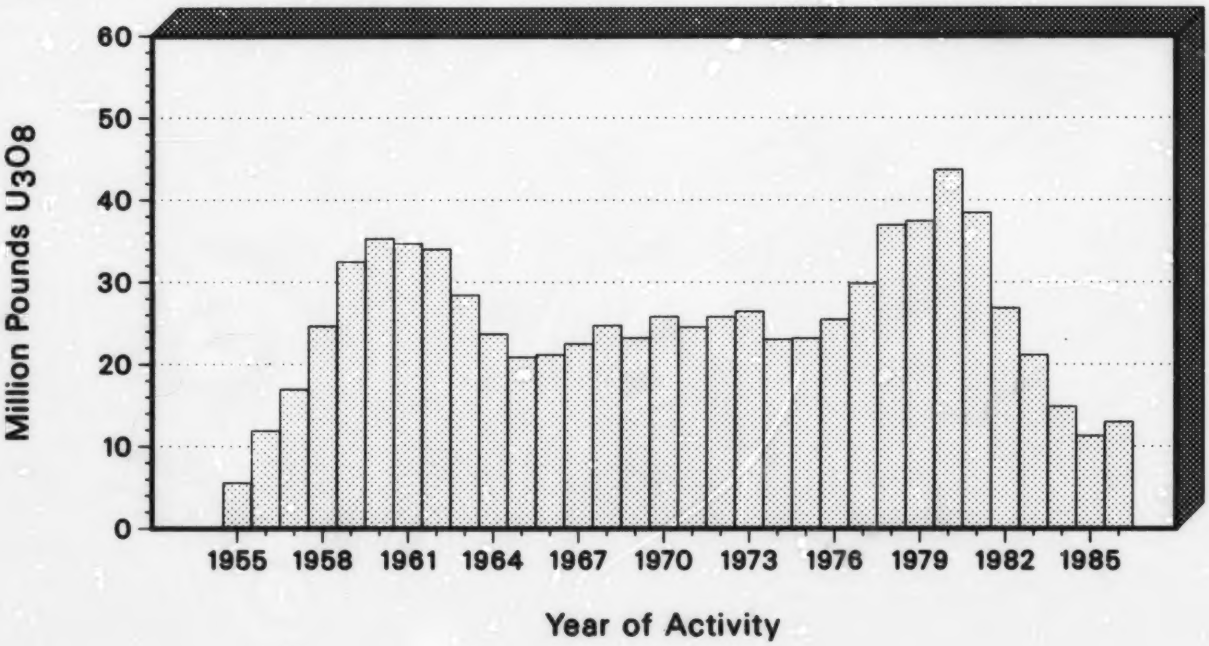
Note: Totals may not equal sum of components due to independent rounding.

1978-1983--Calculated by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

U_3O_8 concentrate production from conventional mills in 1986 was 8.9 million pounds – 2.8 million pounds above the 1985 level. The average grade of ore processed in 1986 increased to about 0.34 percent U_3O_8 from about 0.16 percent in 1985. The sharp increase in the mill feed grade is attributable to the higher grade mined ores in Arizona and New Mexico during the year. The mill recovery factor for all conventional milling increased slightly in 1986 as compared to 1985. Production of U_3O_8 concentrate from "other" sources declined slightly from 1985 levels to just under 4.7 million pounds in 1986. The "other" sources include *in situ* leaching as a byproduct of other processing and some production from heap leaching, mine water, and other solutions. Figure 19 shows the annual uranium concentrate production for the period 1955 through 1986.

Shipments of U_3O_8 concentrate from domestic production facilities decreased from 11.8 million pounds in 1985 to 10.6 million pounds in 1986. The reported 1986 concentrate shipments were about 2.9 million pounds below the total domestic U_3O_8 production for the year. This resulted in an increase in the concentrate inventories held by producers at mills at the end of 1986. Producer shipments of U_3O_8 in 1985 were 0.4 million pounds more than the 1985 production level.

Figure 19. Production of Uranium Concentrate, 1955-1986



Source: See source note in Table 24.

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Uranium Milling Operations

Conventional Milling

After uranium ore has been mined, it is hauled to a mill for processing by conventional milling techniques. The conventional milling process involves the following basic steps: (1) ore handling and preparation, (2) uranium concentration, and (3) product recovery. Ore handling and preparation include such processes as ore blending, crushing, fine ore storage, grinding, and possibly drying or roasting to improve ore-handling and solubility properties. In the newer mills, the use of wet, semiautogenous grinding (SAG) systems reduces the need for multistage crushing and grinding operations. Uranium concentration consists of hydrometallurgical extraction or leaching techniques, using either dilute sulfuric acid or alkaline carbonate solutions as reagents, followed by further concentration of leached uranium by ion exchange or solvent extraction. The product is recovered from solution by chemical precipitation, followed by drying and packaging for shipment.

U.S. conventional milling facilities at the end of 1986 consisted of 19 active and inactive mills with a combined rated capacity of 42,650 tons per day (Tables 26 and 27). Of the 19 mills, only 6 were operating at the end of 1986, and these had a combined rated capacity of 11,650 tons per day. The latter figure represents 27 percent of the total capacity of domestic mills, both operating and on standby.

Table 26. Operating Status of Conventional Uranium Mills at the End of the Year, 1981-1986

Mill Owner	Location	1986 Milling Capacity[a] (short tons of ore per day)	Operating Status at the End of the Year					
			1981	1982	1983	1984	1985	1986
American Nuclear	Gas Hills, WY	950	I	I	I	I	I	I
Anaconda Minerals	Bluewater, NM	6,000	O	I	I	I	[b]I	I
Atlas Minerals	Moab, UT	1,400	O	O	O	[b]I	I	I
Chevron Resources	Hobson, TX	2,500	O	O	O	O	[b]I	O
Conoco/Pioneer	Hobson, TX	(3,400)	O	I	[c]D	D	D	D
Cotter	Canon City, CO	1,200	O	O	O	O	[b]I	O
Dawn Mining	Ford, WA	450	O	I	I	I	I	I
Exxon Minerals	Powder River, WY	(3,200)	O	O	O	D	D	D
Homestake Mining	Grants, NM	R3,400	O	O	O	I	[b]I	O
Quivira Mining	Grants, NM	7,000	O	O	O	O	[b]I	I
Minerals Exploration	Red Desert, WY	3,000	O	O	I	I	I	I
Pathfinder Mines	Gas Hills, WY	2,800	O	O	O	O	[b]I	I
Pathfinder Mines	Shirley Basin, WY	1,800	O	O	O	O	O	O
Petrotomics	Shirley Basin, WY	(1,500)	O	O	O	O	[d]D	D
Plateau Resources	Ticaboo, UT	1,000	C	I	I	I	I	I
Rio Algom Mining	La Sal, UT	750	O	O	O	O	O	O
Rocky Mountain Energy	Powder River Basin, WY	2,000	O	O	O	O	O	[d]I
Sohio Western Mining	Cebolleta, NM	(1,600)	I	I	I	I	I	D
Umetco Minerals/Energy Fuels Nuclear	Blanding, UT	2,000	O	O	[b]I	I	[e]O	O
Umetco Minerals	Uravan, CO	1,300	O	[b]I	[b]I	[b]I	I	I
Umetco Minerals	Natrona, WY	1,400	O	O	[b]I	[b]I	I	I
United Nuclear	Church Rock, NM	(3,000)	O	I	I	I	I	D
Western Nuclear	Jeffrey City, WY	1,700	I	I	I	I	I	I
Western Nuclear	Wellpinit, WA	2,000	O	I	O	I	I	I

[a] Milling capacity based on historical data and data reported on Form EIA-858 for 1986.

[b] Inactive at the end of the year but produced during one or more months of the period.

[c] Dismantling of the mill was in progress.

[d] Permanently shut down at end of year, but processed ore during one or more months of the period.

[e] Produced during one or more months of the period.

Note: O, Operating throughout the year; I, Inactive at the end of the year; C, Under construction; D, Decommissioned.

R, Revised data.

Sources: 1981-1983–Prepared by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986). Milling capacity–U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100 (Grand Junction, Colorado–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

The operating status of conventional uranium mills at the end of each year from 1981 through 1986 is shown in Table 27. On the basis of a 350-day operating year, the average daily mill feed during 1986 was 3,740 tons, or 9 percent of the total available domestic milling capacity. The annual operating level of domestic uranium mills --defined as the average daily mill feed divided by the total daily milling capacity -- has declined since 1981, when the level was 77 percent. Figure 20 shows average uranium ore processing grades and recovery rates from 1967 through 1986.

Nonconventional Uranium Recovery

Domestic nonconventional uranium production facilities in 1986 included 15 *in situ* leaching and byproduct recovery facilities. Of these facilities, 12 were in operation during all or part of the year, including 6 *in situ* leaching, 4 byproduct recovery, and 2 mine water facilities. One copper byproduct facility was not operated in 1986.

Nonconventional facilities produced 4.65 million pounds of U_3O_8 concentrate during 1986 (Table 25). This total was 0.58 million pounds less than the amount produced from nonconventional facilities during 1985.

Table 27. Status of Conventional Uranium Mills at the End of the Year, 1981-1986

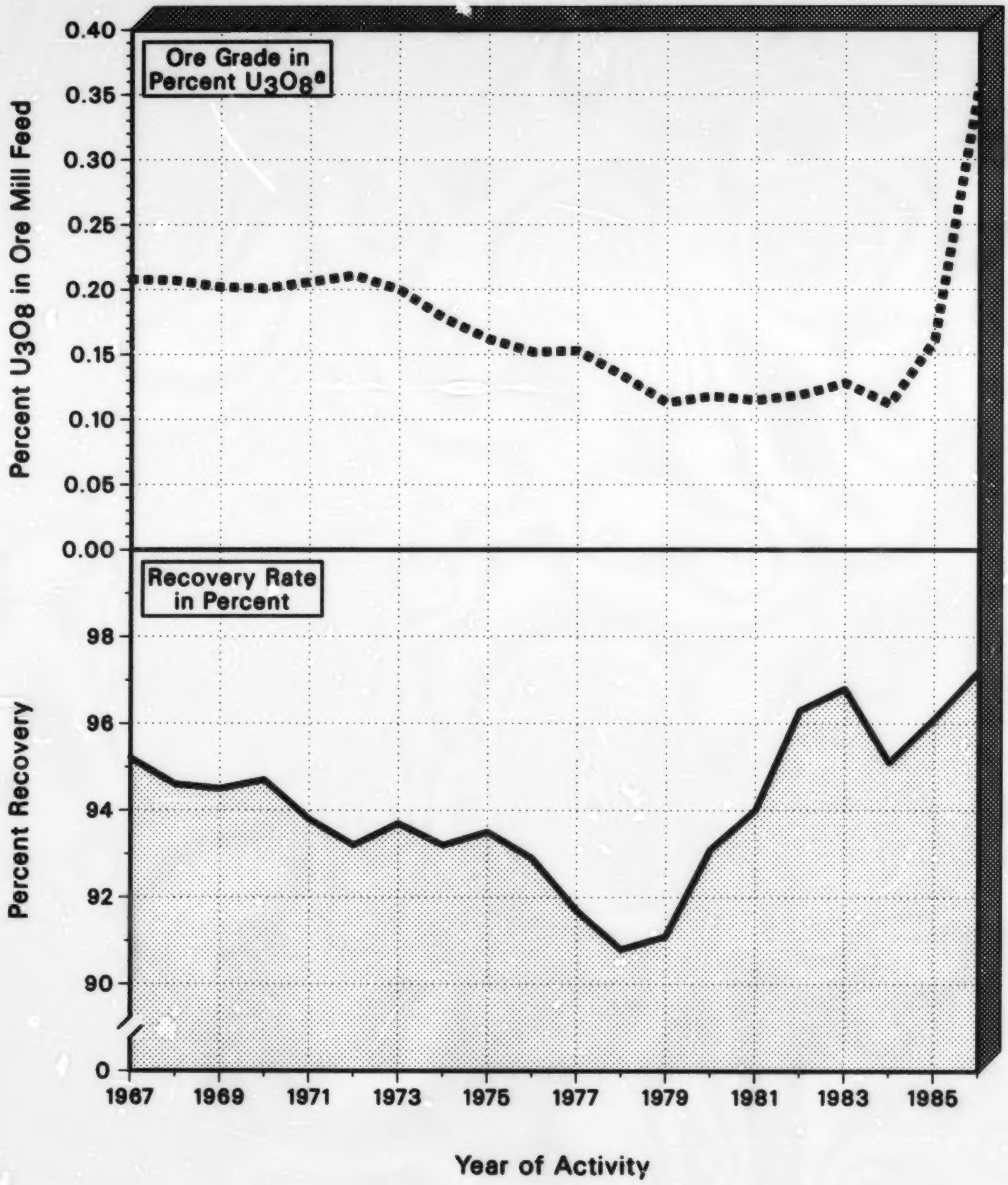
Item	1981	1982	1983	1984	1985	1986
Number of Mills						
Operating	20	14	12	8	4	6
Not Operating	3	10	11	14	17	13
Total	23	24	23	22	21	19
Milling Capacity (tons of ore per day)						
Operating	49,800	33,650	29,250	19,250	6,550	11,650
Not Operating	4,250	21,400	22,400	29,200	R40,700	31,000
Total	54,050	55,050	51,650	48,450	R47,250	42,650
Average Daily Mill Feed (tons of ore per day)[a]	41,560	25,000	16,930	12,330	5,130	3,740
Operating Level as Percent of Total Milling Capacity	77	45	33	25	R11	9

[a] Rounded value, based on 350 workdays per year and total ore fed to process shown in Table 25.

R, Revised data.

Sources: 1981-1982--U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100 (Grand Junction, Colorado, January 1982 and January 1983). 1983--Prepared by staff of the Nuclear and Alternate Fuels Division, Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration, from U.S. Department of Energy, Grand Junction Area Office data files. 1984-1985--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 20. Uranium Ore Processing Grades and Recovery Rates, 1967-1986



[a] Weighted average.

Sources: •1967–1982: U.S. Department of Energy, Grand Junction Area Office, Statistical Data of the Uranium Industry GJO–100 (Grand Junction, Colorado); •1983–1986: See Table 25.

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Employment in the Uranium Raw Materials Industry

Employment in the U.S. uranium raw materials industry, expressed in person-years expended, is summarized in Table 28. Employment has declined each year since 1979, when a total of 21,951 person-years was reported for the categories of uranium exploration, mining, milling, and processing. Total employment in the domestic uranium industry in 1986 was reported as 2,120 person-years, a decrease of 13 percent from the 2,446 person-years reported for 1985. The 1986 reported level of employment is 90 percent less than the peak level of employment in 1979.

For 1986, employment in the categories of mining and processing decreased by 21 percent and 12 percent, respectively, from the levels reported for 1985 (Table 28, Figure 21). The employment levels for exploration and milling in 1986 were essentially unchanged from 1985. The 1986 employment level for mining is the lowest reported by the industry for this category in the past 20 years. Processing employment has declined each year since 1981, the peak year for such activity.

Employment for 1986 is shown by State in Table 29, and the data are shown in graphic form in Figure 22. Wyoming, Texas, New Mexico, and Utah accounted for about 65 percent of the total employment in the industry for 1986. Arizona, Colorado, Florida, and Louisiana also reported significant levels of employment in uranium industry activities.

Table 28. Employment in the U.S. Uranium Industry, 1967-1986
(Person-Years Expended)

Year	Exploration	Mining	Milling	Processing	Total	Percent Change From Prior Year
1967	1,291	3,798	1,662	NA	6,751	--
1968	2,198	4,440	1,717	NA	8,355	23.8
1969	2,632	4,702	1,725	NA	9,059	8.4
1970	2,059	4,428	1,678	NA	8,165	-9.9
1971	1,506	4,218	1,649	NA	7,373	-9.7
1972	1,152	3,721	1,530	NA	6,403	-13.2
1973	1,557	3,516	1,522	NA	6,595	3.0
1974	1,697	3,928	1,668	NA	7,293	10.6
1975	2,049	5,386	2,237	NA	9,672	32.6
1976	2,793	7,092	2,727	511	13,123	35.7
1977	4,140	10,615	2,448	838	18,041	37.5
1978	4,449	12,071	3,053	1,267	20,840	15.5
1979	4,066	13,185	3,236	1,464	21,951	5.3
1980	3,370	11,768	3,251	1,530	19,919	-9.3
1981	2,300	7,473	2,367	1,536	13,676	-31.3
1982	769	5,057	1,956	1,185	8,967	-34.4
1983	374	2,794	1,518	929	5,615	-37.4
1984	235	1,675	987	700	3,597	-35.9
1985	163	1,212	514	557	2,446	-32.0
1986	162	954	513	490	2,120	-13.3

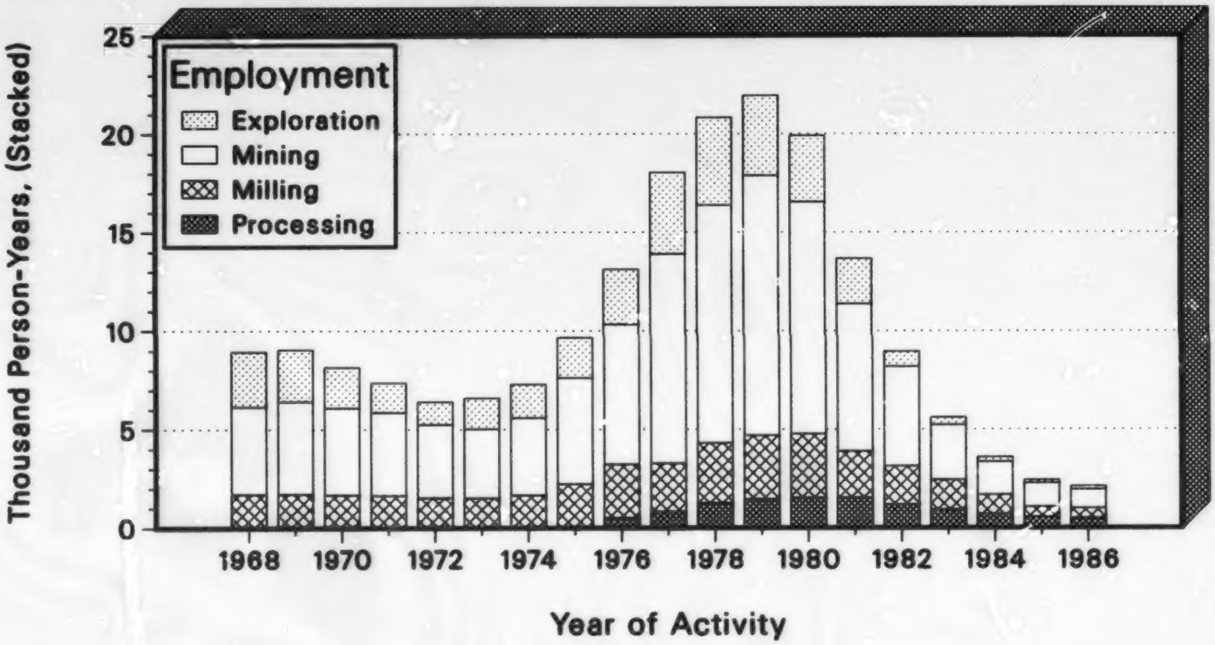
--, Not applicable.

NA, Not available.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1967-1982, Except 1982 Exploration**--U.S. Department of Energy, Grand Junction Area Office, *Statistical Data of the Uranium Industry*, GJO-100(83) (Grand Junction, Colorado, January 1983). **1982-1983 Exploration**--Energy Information Administration, *Survey of U.S. Uranium Exploration Activity 1983*, DOE/EIA-0402(83) (Washington, DC, July 1984). **1982-1983 Mining, Milling, and Processing**--Energy Information Administration, Form EIA-491, "Survey of United States Uranium Marketing Activity" (1983). **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 21. Employment in the Uranium Industry, 1968-1986



Source: See Table 28.

Table 29. Employment in the U.S. Uranium Industry by State, 1986
(Person-Years Expended)

State	Exploration	Mining	Milling	Processing	Total	Percent of Total
Arizona	W	W	0	0	231	10.9
Colorado	15	W	W	W	234	11.0
New Mexico	3	W	W	W	312	14.7
Texas	W	W	W	194	313	14.8
Utah	8	W	W	W	308	14.6
Wyoming	28	W	W	W	441	20.8
Others[a]	W	W	W	W	280	13.2
Total	162	954	513	490	2,120	100.0

[a] Includes Florida, Louisiana, Michigan, Nebraska, Oregon, Pennsylvania, South Dakota, Virginia, and Washington.
W, Withheld to avoid disclosure of individual company data.
Note: Totals may not equal sum of components due to independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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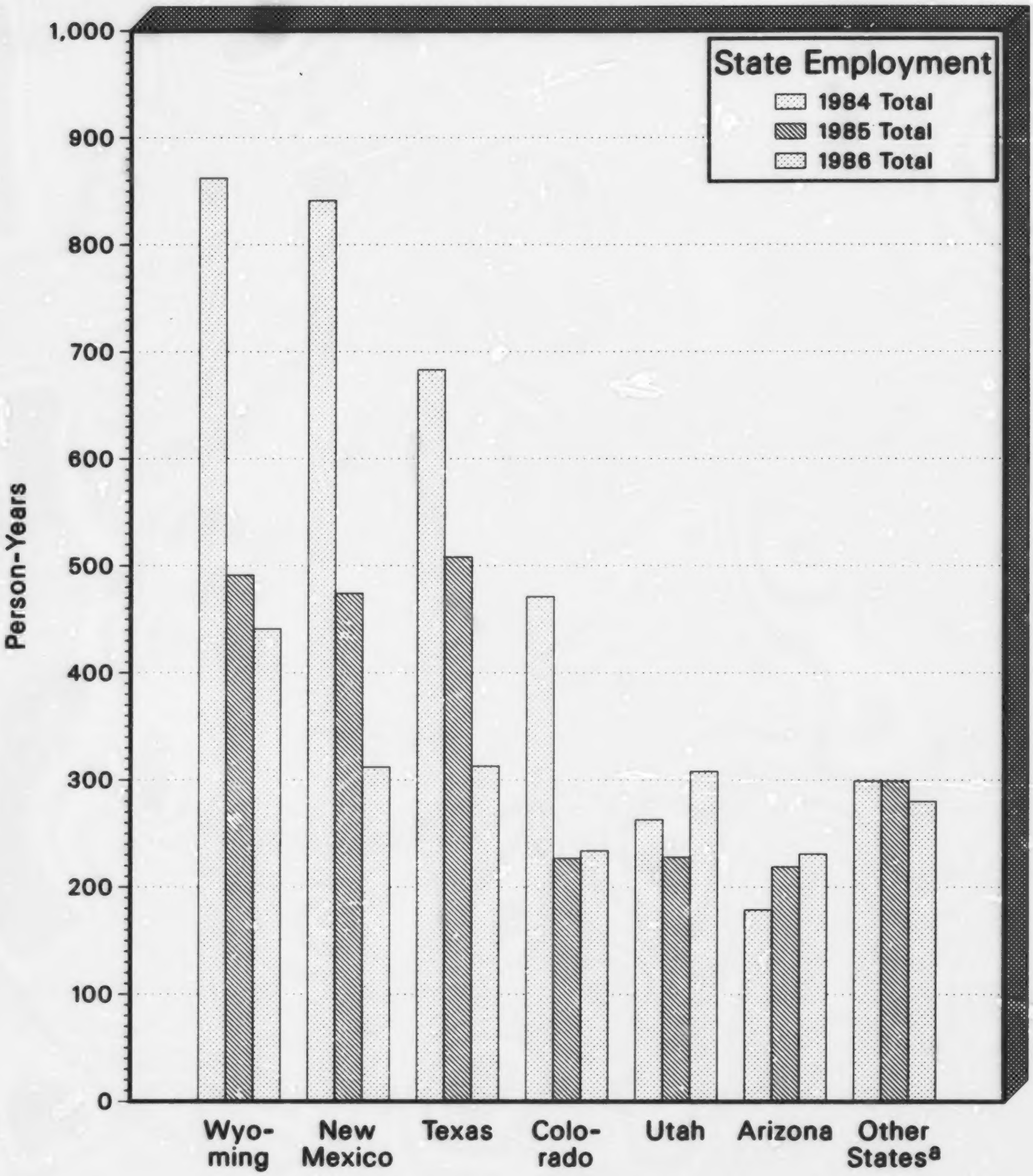
Figure 22. Employment in the Uranium Industry by State, 1984-1986



[a] Other States include California, Florida, Idaho, Louisiana, Michigan, Montana, Nebraska, Oregon, Pennsylvania, South Dakota, Virginia, and Washington.

Source: •1984–1985: Energy Information Administration, Uranium Industry Annual 1985, DOE/EIA-0478(85) (Washington, DC, November 1986). •1986: See Table 29.

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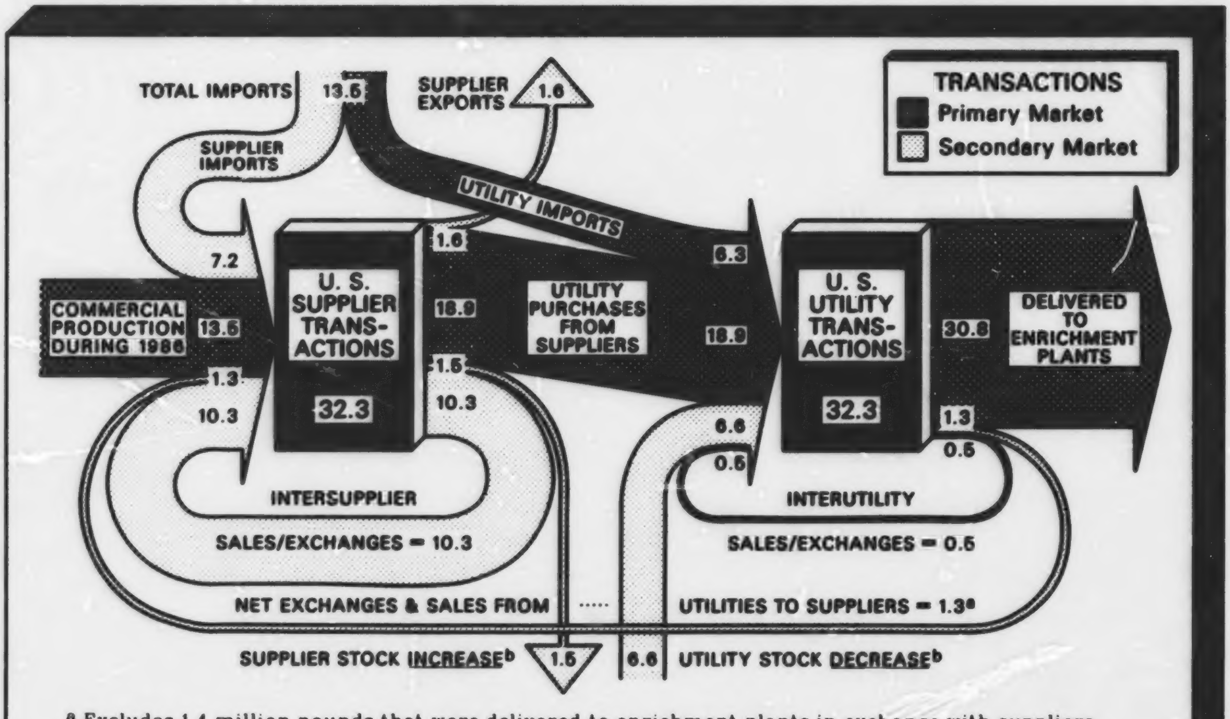
3. Uranium Marketing Activity

Introduction

This chapter contains the following information on uranium marketing activity: quantity of uranium delivered under contract in 1986 and expected to be delivered in 1987 and beyond, uranium prices, feed deliveries to domestic and foreign enrichment suppliers, uranium inventories, secondary market commitments, and uranium available for sale by domestic suppliers and utilities for 1987 through 1996.

Primary and secondary market interrelationships between domestic suppliers and utilities for 1986 are shown diagramatically in Figure 23. The arrows in

Figure 23. Natural Uranium Market Activity During 1986


TOTAL IMPORTS
13.5
SUPPLIER EXPORTS
1.6
TRANSACTIONS
Primary Market
Secondary Market
SUPPLIER IMPORTS
UTILITY IMPORTS
1.6
6.3
7.2
COMMERCIAL PRODUCTION DURING 1986
13.5
U. S. SUPPLIER TRANS-ACTIONS
18.9
UTILITY PURCHASES FROM SUPPLIERS
18.9
U. S. UTILITY TRANS-ACTIONS
30.8
DELIVERED TO ENRICHMENT PLANTS
1.3
1.5
10.3
32.3
10.3
6.6
0.5
32.3
1.3
0.5
INTERSUPPLIER
SALES/EXCHANGES = 10.3
INTERUTILITY
SALES/EXCHANGES = 0.5
NET EXCHANGES & SALES FROM
UTILITIES TO SUPPLIERS = 1.3a
SUPPLIER STOCK INCREASEb
1.5
6.6
UTILITY STOCK DECREASEb

a Excludes 1.4 million pounds that were delivered to enrichment plants in exchange with suppliers.

b Calculated stock changes cannot be reconciled with data in Table 47.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey", 1986.

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Figure 23 illustrate the market mechanisms through which domestic suppliers and utilities procured and disposed of uranium in 1986. The numbers indicate millions of pounds of natural uranium for each type of transaction.

In 1986, domestic suppliers[5] obtained uranium from a number of sources. Most of the uranium sold by domestic suppliers (as a group) comes from their own production facilities. Intersupplier sales are both a source of supply and a market for domestic suppliers. Imports have become an important factor in the uranium market in recent years. Exports to foreign utilities by domestic suppliers and utilities exceeded imports from 1978 through 1980. Beginning in 1981, imports exceeded exports, and this trend is expected to continue. Nevertheless, U.S. utilities continue to obtain the bulk of their uranium requirements from domestic suppliers. Direct imports by utilities decreased slightly in 1986.

Domestic Purchase Commitments by Utilities

Table 30 lists the annual delivery commitments to domestic utilities from domestic uranium suppliers. Actual deliveries in 1986 were 18.9 million pounds U_3O_8, only 0.5 million pounds more than the expected deliveries for contracts in place at the beginning of 1986. Projected cumulative deliveries from current contracts for the years beyond 1986 are reported to be 136.6 million pounds U_3O_8, down substantially from the 179.6 million pounds reported last year. For the year 1987 and after, firm delivery commitments were reduced by 28.5 million pounds, and optional deliveries were reduced by 14.4 million pounds U_3O_8, bringing the total reduction in delivery commitments to 43.0 million pounds U_3O_8 for the period 1987 and later. This decrease is attributable mainly to the fact that eight utilities reported significant reductions in existing contractual commitments and, in some cases, termination of contracts.

Table 30. Delivery Commitments for Uranium to Utilities from Domestic Suppliers, 1986-2000 and Later
(Million Pounds U_3O_8)

Year of Delivery	As of December 31, 1985				As of December 31, 1986				Change in Total From December 31, 1985 to December 31, 1986	
	Firm	Optional	Total	Cumulative	Firm	Optional	Total	Cumulative	Total	Cumulative
1986[a]	17.7	0.7	18.4	18.4	[a]18.9	0.0	18.9	18.9	0.5	0.5
1987	16.3	.8	17.1	35.6	16.2	.1	16.3	35.2	-.8	-.3
1988	15.0	1.2	16.2	51.8	14.3	1.4	15.6	50.9	-.6	-.9
1989	13.4	2.2	15.6	67.4	11.1	1.5	12.6	63.5	-2.9	-3.8
1990	10.4	3.6	14.0	81.4	10.4	2.6	12.9	76.5	-1.1	-4.9
1991	9.6	6.7	16.2	97.6	10.6	3.2	13.8	90.3	-2.4	-7.3
1992	8.0	5.1	13.2	110.8	7.2	4.0	11.2	101.5	-2.0	-9.3
1993	7.4	5.3	12.7	123.4	5.6	3.3	8.8	110.3	-3.8	-13.2
1994	7.1	4.1	11.1	134.6	4.8	3.3	8.0	118.3	-3.1	-16.2
1995	6.8	4.1	10.9	145.4	4.5	3.3	7.8	126.1	-3.1	-19.3
1996	6.4	3.4	9.8	155.3	6.1	2.8	8.9	135.0	-.9	-20.3
1997	5.4	2.6	7.9	163.2	3.3	2.7	6.0	141.0	-2.0	-22.2
1998	5.1	4.0	9.0	172.3	3.5	2.6	6.1	147.1	-2.9	-25.2
1999	4.7	2.2	6.8	179.1	3.0	.8	3.8	150.9	-3.0	-28.2
2000 and Later	16.8	2.1	19.0	198.1	3.2	1.5	4.7	155.5	-14.3	-42.5
Total	150.0	48.0	198.1	–	122.7	32.9	155.5	–	–	–

[a] Actual deliveries.
–, Not applicable.
Note: Totals may not equal sum of components due to independent rounding.
Source: 1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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[5] In this report, "domestic suppliers" are domestic companies that sell uranium and are not electric utility companies. This includes uranium producers and agents. See the Glossary for a definition of "domestic uranium industry."

Table 31 shows the number of new contracts signed in 1982-1986 by U.S. utilities for purchases from domestic suppliers. Twenty-five uranium procurement contracts were signed by utilities with domestic suppliers in 1986 -- 19 spot market purchases and 6 long-term contracts. The total amount of uranium represented by these new contracts is 14.3 million pounds U_3O_8, of which 5.4 million pounds are spot market purchases and the remaining 8.9 million pounds will be delivered under long-term contracts.

Table 31. New Contracts Signed by U.S. Utilities for Purchases from Domestic Suppliers

Year of Signing	Spot Purchases[a]		Long-Term Contracts[b]		Total	
	Number of Contracts	Quantity (Million Pounds U_3O_8)	Number of Contracts	Quantity (Million Pounds U_3O_8)	Number of Contracts	Quantity (Million Pounds U_3O_8)
1982	7	0.5	7	9.1	14	9.6
1983	16	2.7	5	15.5	21	18.2
1984	12	W	2	W	14	6.5
1985	32	4.8	3	3.4	35	8.2
1986	19	5.4	6	8.9	25	14.3

[a] For the purpose of this table, a spot purchase is defined as a purchase whereby delivery or deliveries of the material will take place in the same year the contract is signed or in the following year. No deliveries will occur beyond the year after the year of contract signing.

[b] For the purpose of this table, a long-term contract is defined as a purchase contract whereby at least one delivery of material will occur beyond the year after the year of contract signing. Deliveries can also be made within the year of signing or the year after.

W, Withheld to avoid disclosure of individual company data.

Sources: **1982**--Energy Information Administration, *1982 Survey of United States Uranium Marketing Activity*, DOE/EIA-0403(82) (Washington, DC, September 1983). **1983**--Energy Information Administration, *1983 Survey of United States Uranium Marketing Activity*, DOE/EIA-0403(83) (Washington, DC, August 1984). **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 32 shows annual delivery commitments by source of uranium. Of the total uranium delivered in 1986, 15.5 million pounds were of domestic origin, and 3.4 million pounds were foreign-origin uranium imported by domestic suppliers and resold to utilities. For 1987 and beyond, delivery commitments are predominantly for domestic-origin uranium or unspecified. The latter category, however, may include imports, since the origin of this material is not specified, and some of it may have been imported previously.

Figure 24 displays uranium delivery commitments to utilities for options and for firm and captive commitments for the years 1986 through 1999. For example, in 1988, optional deliveries account for about 9 percent of the total delivery commitments. In 1994, they are projected to account for 41 percent of the total.

Table 32. Source of Uranium Committed for Delivery to Utilities from Domestic Suppliers, 1986-2000 and Later, as of December 31, 1986

(Million Pounds U_3O_8)

Year of Delivery	Origin of Committed Uranium[a]			Total
	Domestic	Unspecified	Foreign	
1986[b]	15.5	0.0	3.4	18.9
1987	9.8	5.5	1.0	16.3
1988	9.5	5.9	.3	15.6
1989	8.0	4.3	.3	12.6
1990	8.6	4.3	.1	12.9
1991	8.2	5.5	.1	13.8
1992	6.8	4.3	.1	11.2
1993	4.9	3.7	.2	8.8
1994	4.9	2.6	.5	8.0
1995	4.7	2.6	.5	7.8
1996	3.7	4.7	.5	8.9
1997	3.0	3.0	0	6.0
1998	2.9	3.2	0	6.1
1999	2.9	.9	0	3.8
2000 and Later	3.6	1.1	0	4.7
Total	97.1	51.5	7.0	155.5

[a] Assumes that all delivery options will be exercised.

[b] Actual deliveries.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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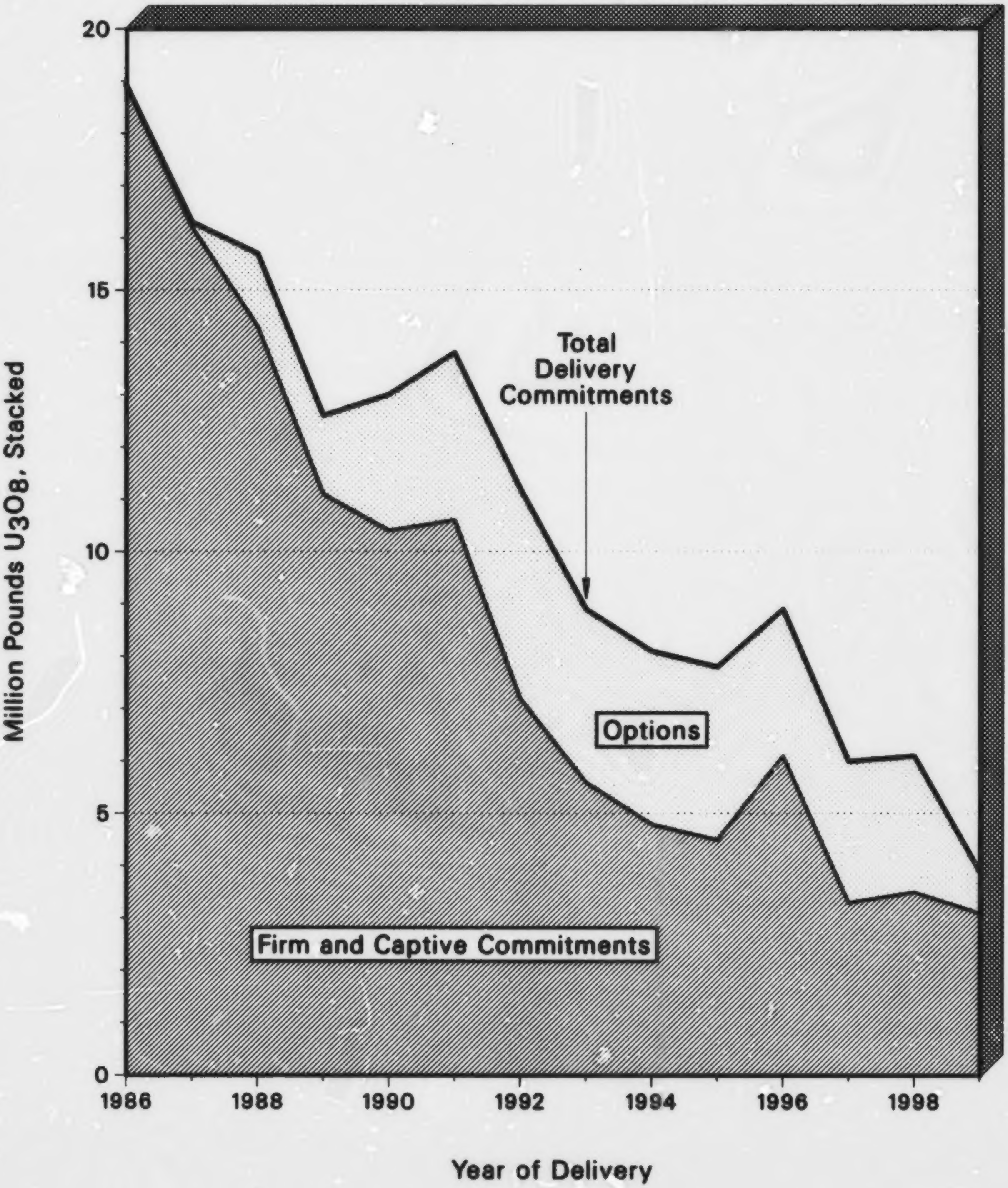
Figure 24. Uranium Delivery Commitments to Utilities from Domestic Suppliers 1986-1999, as of December 31, 1986



Source: See source note in Table 30.

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Domestic Procurement Arrangements

Table 33 gives the distribution of uranium deliveries by U.S. suppliers, by year of delivery and by type of domestic uranium procurement, for contracts in place as of December 31, 1986. Three types of procurement are recognized: contract price, market price, and "other." Contract prices relate to procurement arrangements in which prices and the associated escalation factors (if any) are specified at the time the contract is signed. In market price contracts, the prices are commonly (but not always) determined at or some time before delivery and are based on prevailing market prices at that time. Some market price contracts contain floor (or minimum) prices that provide a lower limit on the eventual price. A base floor price and the means of escalation (if any) are generally specified when the contract is signed. The "other" procurement type refers to captive production and other arrangements that fall outside the contract and market price categories. Captive production refers to procurement by utilities with direct control of uranium properties.

Uranium deliveries in 1986 were about 36 percent contract price, 49 percent market price, and 15 percent "other." For all delivery years combined, contract price procurement accounts for 30 percent, market price accounts for about 44 percent, and "other" procurement arrangements account for some 27 percent of all delivery commitments in place as of December 31, 1986. As noted previously, 25 new uranium contracts were signed by utilities with domestic suppliers in 1986. Of these contracts, 19 were spot market purchases, 18 of which were reported to have a contract-specified pricing mechanism with a fixed price. Five of the six long-term purchases were reported to be in the market price category. One spot purchase and one long-term contract were classified as "other" pricing mechanisms.

Table 33. Domestic Uranium Delivery Commitments to Utilities by Procurement Arrangement, 1986-2000 and Later, as of December 31, 1986

Year of Delivery	Contract Price		Market Price		Other		Total (million pounds U_3O_8)
	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	
1986	6.8	35.9	9.3	49.2	2.8	14.9	18.9
1987	7.4	45.5	6.8	41.8	2.1	12.6	16.3
1988	5.0	32.1	7.5	47.9	3.1	20.0	15.6
1989	4.1	32.7	4.9	38.7	3.6	28.5	12.6
1990	4.9	38.2	4.6	35.9	3.3	25.9	12.9
1991	5.5	39.7	5.2	37.5	3.1	22.7	13.8
1992	3.4	30.8	4.8	42.6	3.0	26.6	11.2
1993	1.7	18.9	4.5	51.3	2.6	29.8	8.8
1994	.6	7.8	4.8	59.4	2.6	32.7	8.0
1995	.7	8.4	4.5	57.6	2.6	34.0	7.8
1996	2.8	31.2	3.5	39.2	2.6	29.6	8.9
1997	.6	10.4	3.1	52.1	2.3	37.6	6.0
1998	1.1	18.4	2.7	44.7	2.3	36.9	6.1
1999	.6	16.4	.9	24.3	2.3	59.4	3.8
2000 and Later	1.2	25.3	.5	10.7	3.0	64.1	4.7
Total	46.5	29.9	67.7	43.5	41.4	26.6	155.5

Note: Totals may not equal sum of components due to independent rounding. Percentages were calculated using unrounded data.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 34 gives a more detailed breakdown on the use of floor price in market price contracts. Three categories are presented: (1) contracts with a specific floor price, (2) contracts in which the floor price is related to production cost, and (3) contracts with no floor price provision. For 1986 deliveries under a market price contract, 2.2 million pounds (23 percent) had a price floor, 0.9 million (9 percent) had a cost floor, and 6.3 million pounds (68 percent) had no floor associated with the market price. For all market price contracts in place as of December 31, 1986, 13 percent of the total quantity to be delivered in all years has a price floor, 2 percent has a cost floor, and 86 percent has no floor.

Table 34. Uranium Delivery Commitments to Utilities Specified in Market Price Contracts by Floor Price Arrangement, 1986-2000 and Later, as of December 31, 1986

Year of Delivery	Price Floor		Cost Floor		No Floor		Total (million pounds U_3O_8)
	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	Million Pounds U_3O_8	Percent of Annual Total	
1986	2.2	23.3	0.9	9.2	6.3	67.5	9.3
1987	1.4	20.1	.1	1.5	5.4	78.5	6.8
1988	1.1	14.5	.1	1.3	6.3	84.1	7.5
1989	1.0	20.6	.1	2.0	3.8	77.3	4.9
1990	.7	16.1	0	0	3.9	83.9	4.6
1991	.7	14.4	0	0	4.4	85.6	5.2
1992	.5	11.3	0	0	4.2	88.7	4.8
1993	.3	7.4	0	0	4.2	92.6	4.5
1994	.3	7.0	0	0	4.4	93.0	4.8
1995	.1	2.2	0	0	4.4	97.8	4.5
1996	.1	2.9	0	0	3.4	97.1	3.5
1997	.1	3.2	0	0	3.0	96.8	3.1
1998	0	0	0	0	2.7	100.0	2.7
1999	0	0	0	0	.9	100.0	.9
2000 and Later	0	0	0	0	.5	100.0	.5
Total	8.6	12.8	1.2	1.7	57.9	85.5	67.7

Note: Totals may not equal sum of components due to independent rounding. Percentages were calculated using unrounded data.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

U.S. Uranium Prices

This section of the report presents uranium prices for contracts between domestic suppliers and domestic utilities. Prices are given for contract price and market price procurements. All prices presented in this chapter and throughout the entire report are quantity-weighted averages.

Prices of Contract-Specified and Settled Market-Price Contracts

Table 35 presents the average contract prices for actual deliveries made in 1982 through 1986. Market price settlements for 1982 through 1986 are included with "contract prices" because, as settled prices, they are similar to "contract prices." This procedure gives a generally comprehensive average price for actual deliveries (except for deliveries made under litigation settlements and/or "other" pricing mechanisms).

Also shown in Table 35 is an adjusted price, which includes estimates for prices not reported by some respondents. The adjusted price is a weighted average of reported prices and price estimates for contracts held by respondents not supplying price information; it is based on a regression analysis of reported prices. Appendix B of this report contains details for computing the adjusted price.

The reported price for deliveries in 1986 averaged \$30.01 per pound U_3O_8, compared to the average price for actual 1985 deliveries of \$31.43 per pound. The average delivered price decreased primarily from the effect of spot-market contracts; 2.2 million pounds U_3O_8 were delivered under contracts signed in 1986 at a weighted average price of \$16.91 per pound.

Table 35. Average Contract Price and Market Price Settlements for Actual Deliveries 1982-1986
(Year-of-Delivery Dollars)

Year of Delivery	Reported Price (dollars per pound U_3O_8)	Quantity for Which Price is Reported (million pounds U_3O_8)	Quantity for Which Price is Not Reported (million pounds U_3O_8)	Adjusted Price[a] (dollars per pound U_3O_8)
1982	38.37	16.7	2.6	39.82
1983	38.21	17.4	.5	37.81
1984	32.65	16.1	.3	32.38
1985	31.43	15.8	.7	30.79
1986	30.01	12.1	.0	30.01

[a] Includes estimates of the quantity for which no price is reported.

Note: Price excludes uranium delivered under litigation settlements.

Sources: 1982--Energy Information Administration, *1982 Survey of United States Uranium Marketing Activity*, DOE/EIA-0403 (Washington, DC, September 1983). 1983--Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983*, DOE/EIA-0403(83) (Washington, DC, August 1984). 1984-1985--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Contract-Specified Price Contracts

Table 36 shows the average reported price for actual deliveries in 1982-1986 and expected deliveries in 1987-1993 for contracts with a contract-specified pricing mechanism. The average price for deliveries in 1986 was \$32.58 per pound, down somewhat from the average of \$34.74 per pound for 1985 deliveries. The expected price for 1987 deliveries under this pricing mechanism is \$36.44 per pound. The 1987 price will probably be somewhat lower, however, because of new contracts that will specify deliveries in 1987 at a lower base price, thus lowering the average price.

Figure 25 displays the distribution of reported contract prices by year of delivery. The percentages indicated in the figure reflect the quantity of uranium under contract that falls into each \$5 price interval. The price for 1986 deliveries ranged from approximately \$10.00 per pound U_3O_8 to \$70.00 per pound. For 1987, the estimated price range is from approximately \$15.00 to over \$115.00 per pound. In general, Figure 25 illustrates the large variance in actual prices paid for 1986 deliveries and in projected prices for future deliveries. This variance can be attributed to many factors, including but not limited to the following: the types of escalation factors specified in the contracts, respondents' projections of the value of these escalation factors, and the year the contracts were signed.

Table 36. Average Price of Contract-Specified Price Contracts, 1982-1993, as of December 31, 1986
(Year-of-Delivery Dollars)

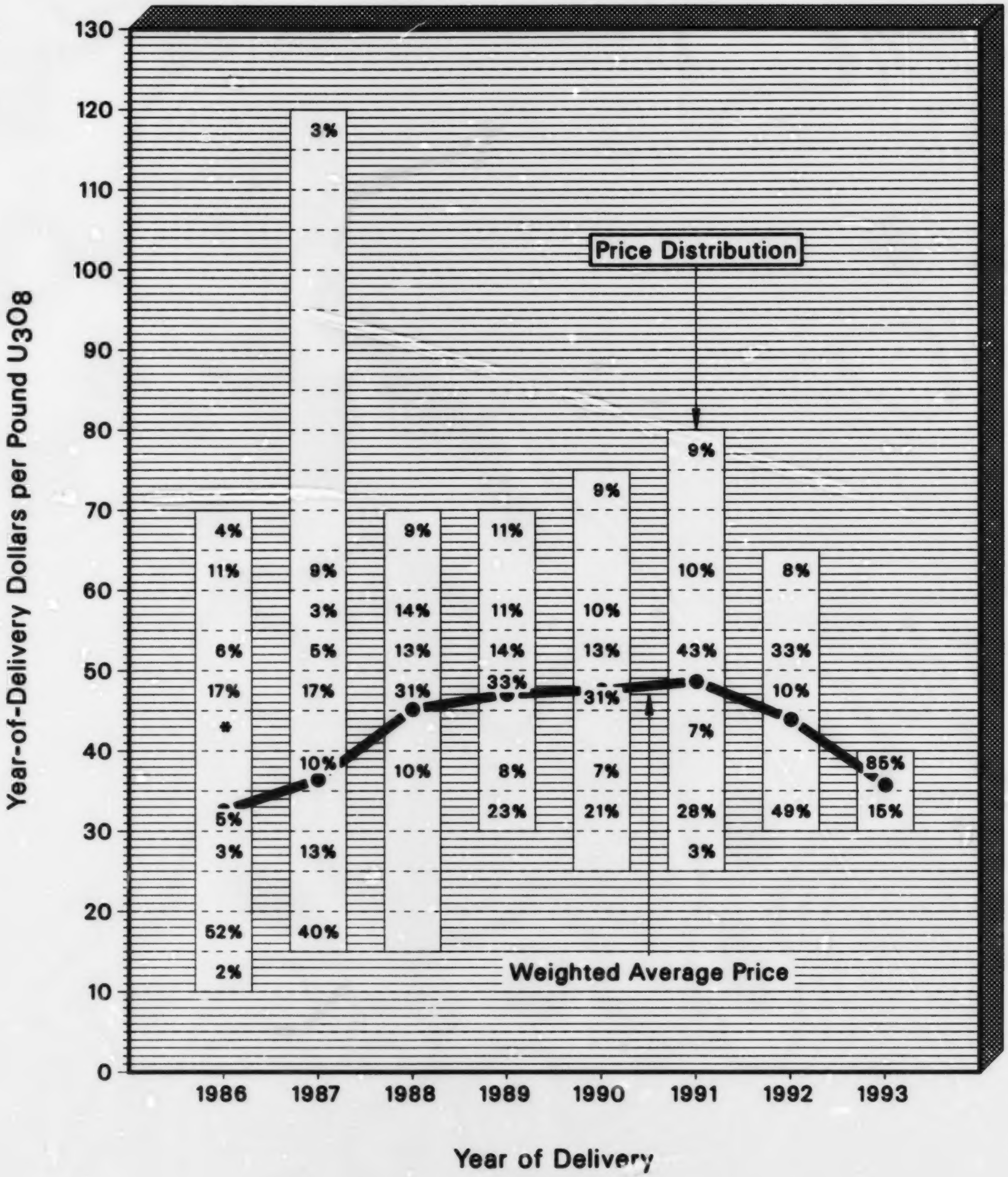
Year of Delivery	Reported Price (dollars per pound U_3O_8)	Quantity for Which Price is Reported (million pounds U_3O_8)	Quantity for Which Price is Not Reported (million pounds U_3O_8)	Adjusted Price[a] (dollars per pound U_3O_8)
1982	[b] 35.36	8.2	0.8	35.43
1983	[b] 39.90	9.5	.5	39.10
1984	[b] 33.60	7.2	.3	32.97
1985	[b] 34.74	8.9	.2	34.34
1986	[b] 32.58	6.1	0	32.58
1987	36.44	6.6	.2	36.10
1988	45.18	3.9	.7	44.27
1989	47.04	3.6	.2	46.03
1990	47.56	3.9	.7	47.01
1991	48.62	3.9	1.2	49.57
1992	43.90	2.5	.6	46.21
1993	35.75	1.3	0	37.57

[a] Includes estimate of the quantity for which no price is reported.

[b] Prices of actual deliveries. Excludes uranium delivered under litigation settlements.

Sources: 1982—Energy Information Administration, *1982 Survey of United States Uranium Marketing Activity*, DOE/EIA-0403 (Washington, DC, September 1983). 1983—Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983*, DOE/EIA-0403(83) (Washington, DC, August 1984). 1984-1985—Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 25. Reported Contract-Specified Price, 1986-1993, as of December 31, 1986



* Empty boxes contain less than 0.5 percent of annual contract quantity.

Note: Percentages in the boxes reflect contract quantities that fall into the $5 price intervals.

Source: See Table 36.

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Market Price Contracts

Table 37 shows the average reported floor price of market price contracts for actual deliveries in 1982 through 1986, and projected deliveries in 1987 through 1989. Also shown in Table 37 is the adjusted floor price. Again, a detailed explanation of the statistical methods used to derive the adjusted price is provided in Appendix B. As can be seen in Table 37, the average reported floor price for actual deliveries declined from $50.98 in 1982 to $38.41 in 1985. The average floor price increased by $3.35 from 1985 to 1986.

Table 37. Average Floor Price of Market Price Contracts, 1982-1989, as of December 31, 1986

(Year-of-Delivery Dollars)

Year of Delivery	Reported Price (dollars per pound U_3O_8)	Quantity for Which Price Is Reported (million pounds U_3O_8)	Quantity for Which Price Is Not Reported (million pounds U_3O_8)	Adjusted Price[a] (dollars per pound U_3O_8)
1982	[b] 50.98	5.7	1.8	51.99
1983	[b] 50.67	3.6	0	50.67
1984	[b] 45.43	5.0	0	45.43
1985	[b] 38.41	4.3	.5	36.10
1986	[b] 41.76	2.9	0	41.76
1987	43.00	.8	.2	38.68
1988	43.48	.6	0	43.48
1989	37.06	.3	.2	31.93

[a] Includes estimates of the quantity for which no price is reported.

[b] Price of actual deliveries. Excludes uranium delivered under litigation settlements.

Sources: 1982-1983–Energy Information Administration, Form EIA-491, "Survey of United States Uranium Marketing Activity" (1982, 1983). 1984-1985–Energy Information Administration, Uranium Industry Annual 1985, DOE/EIA-0478(85) (Washington, DC., November 1986). 1986-1989–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey," (1986).

Table 38 gives the average price settlements of market price contracts for 1982 through 1986 deliveries. The average price for settlements with and without price floors increased slightly from $27.15 in 1985 to $27.39 in 1986. The settled price for contracts with no price floor increased from $15.46 in 1985 to $16.93 in 1986.

Figure 26 illustrates the annual price distribution and average reported floor price in market price contracts from 1987 through 1989. Ranges of market price settlements for 1986, including settlements with and without price floors, are also indicated. Because prices are reported in year-of-delivery dollars, changes in average floor price reflect varying expectations of future escalation rates as well as underlying contract trends.

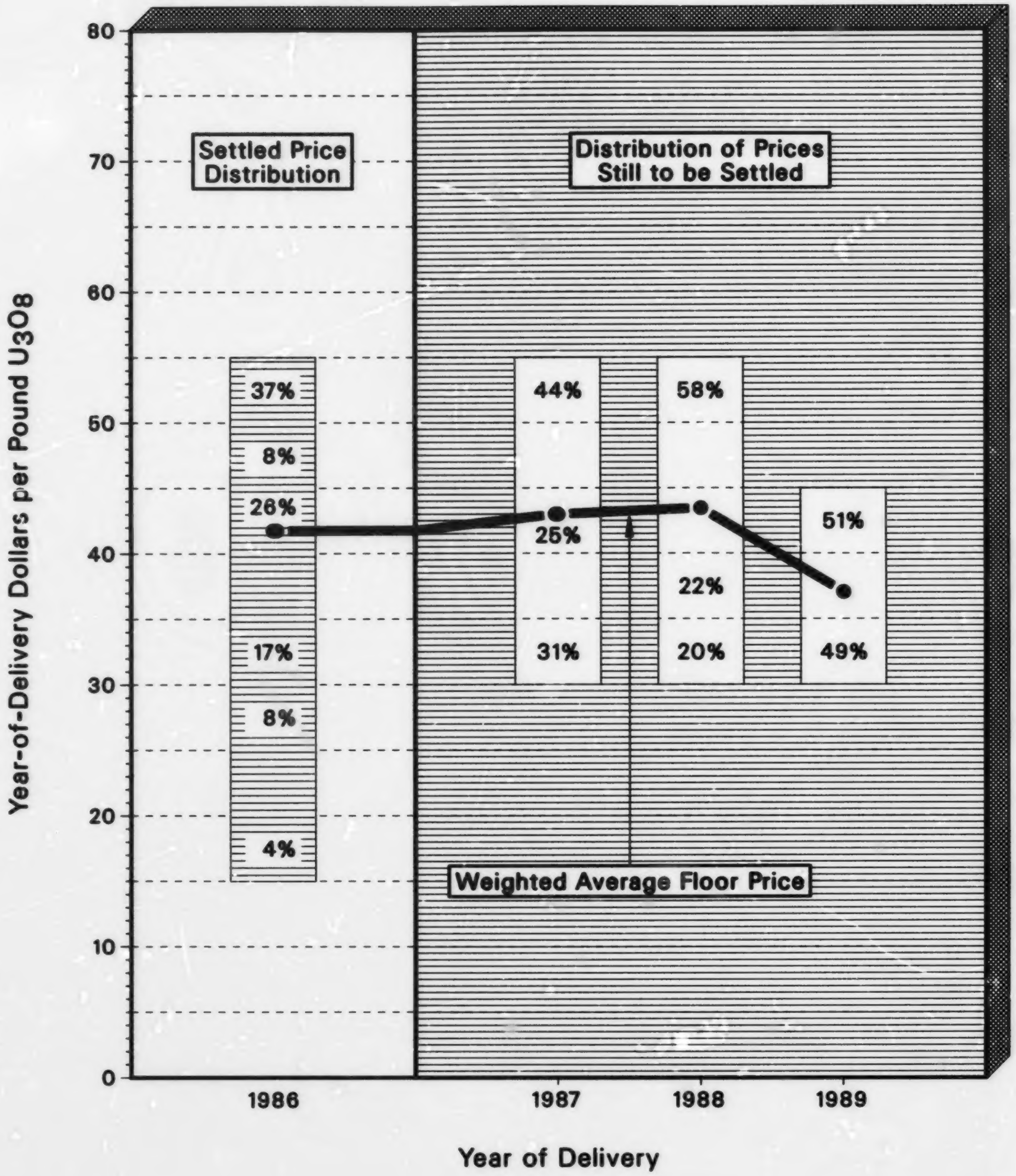
Table 38. Average Reported Price Settlements of Market Price Contracts, 1982-1986
(Year-of-Delivery Dollars)

Contract Type	Year of Delivery				
	1982	1983	1984	1985	1986
No Floor					
Average Reported Price (dollars per pound U_3O_8)	21.50	24.05	16.87	15.46	16.93
Amount of Uranium (million pounds U_3O_8)	2.8	4.3	4.1	2.9	3.4
Price and Cost Floor					
Average Reported Price (dollars per pound U_3O_8)	50.98	50.67	44.71	35.62	41.06
Amount of Uranium (million pounds U_3O_8)	5.7	3.6	4.8	4.0	2.6
Total					
Average Reported Price (dollars per pound U_3O_8)	41.27	36.18	31.88	27.15	27.39
Amount of Uranium (million pounds U_3O_8)	8.5	7.9	8.9	6.9	6.0

Note: Price excludes uranium delivered under litigation settlements.

Sources: 1982-1983–Energy Information Administration, Form EIA-491, "Survey of United States Uranium Marketing Activity" (1982, 1983). 1984-1985–Energy Information Administration, Uranium Industry Annual 1985, DOE/EIA-0478(85) (Washington, DC., November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey," (1986).

Figure 26. Reported Floor Prices Cited in Market Price Contracts, 1986-1989, as of December 31, 1986



Note: Percentages in the boxes reflect contract quantities that fall into the $5 price intervals. Empty boxes contain less than 0.5 percent of the annual contract quantity.

Source: See Table 37.

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Base Price of Contract-Specified Price Contracts and Market Price Contracts with Price Floors

Table 39 shows the average price for contract-specified price and market price contracts with price floors. Prices are shown in January 1987 dollars, and the average applies to all future years of delivery. These prices represent an average base price as of January 1, 1987, from which future escalated prices will be established. For contracts signed in 1976, the average price (in January 1987 dollars) for future deliveries is $47.43 per pound U_3O_8. The average price for contracts signed in 1978 is slightly higher, at 48.52 per pound U_3O_8. For contracts signed after 1978 the average price decreases, reaching $18.11 per pound U_3O_8 for those signed in 1986.

Foreign Uranium Purchases and Sales

Table 40 and Figure 27 show the history and projections (based on contracts in place at the end of 1986) of U.S. imports and exports of uranium from 1967 to beyond 2000. These data do not include purchases of foreign-origin uranium by U.S. companies to be delivered to foreign customers or purchase transactions between domestic utilities and domestic suppliers in which foreign uranium may be delivered at the supplier's option.

Through 1986, U.S. companies imported a cumulative total of 92.0 million pounds U_3O_8 for domestic end use. Most of this imported material came from Canada and South Africa. Imports increased from 11.7 million pounds in 1985 to 13.5 million pounds in 1986. Total import commitments for the years 1987 to beyond 2000 increased by 5.0 million pounds from last year's survey.

Table 39. Average Price for Contract-Specified Price and Market Price Contracts with Price Floors, by Year of Signing, 1976-1986

(January 1987 Dollars)

Year of Contract Signing	Average Price (dollars per pound U_3O_8)	Quantity (million pounds U_3O_8)
1976	47.43	2.0
1977	NR	NR
1978	48.52	16.6
1979	W	W
1980	W	W
1981	NR	NR
1982	29.00	.9
1983	29.76	5.0
1984	24.95	2.0
1985	18.28	1.7
1986	18.11	4.5

Note: Includes data only for contracts specifying delivery after 1986. Excludes uranium to be delivered under litigation settlements.

W, Withheld to avoid disclosure of company-specific data.

NR, Not reported.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 40. Actual and Committed Imports and Exports of Uranium by Utilities and Domestic Suppliers for Commercial Uses, 1967 to 2000 and Later as of December 31, 1986

(Million Pounds U_3O_8)

Year of Delivery	Imports		Exports[a]		Net Imports (Net Exports)	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
Actual						
1967	0	0	1.4	1.4	(1.4)	(1.4)
1968	0	0	1.6	3.0	(1.6)	(3.0)
1969	0	0	1.0	4.0	(1.0)	(4.0)
1970	0	0	4.2	8.2	(4.2)	(8.2)
1971	0	0	.4	8.6	(0.4)	(8.6)
1972	0	0	.2	8.8	(0.2)	(8.8)
1973	0	0	1.2	10.0	(1.2)	(10.0)
1974	0	0	3.0	13.0	(3.0)	(13.0)
1975	1.4	1.4	1.0	14.0	0.4	(12.6)
1976	3.6	5.0	1.2	15.2	2.4	(10.2)
1977	5.6	10.6	4.0	19.2	1.6	(8.6)
1978	5.2	15.8	6.8	26.0	(1.6)	(10.2)
1979	3.0	18.8	6.2	32.2	(3.2)	(13.4)
1980	3.6	22.4	5.8	38.0	(2.2)	(15.6)
1981	6.6	29.0	4.4	42.4	2.2	(13.4)
1982	17.1	46.1	6.2	48.6	10.9	(2.5)
1983	8.2	54.3	3.3	51.9	4.9	2.4
1984	12.5	66.8	2.2	54.1	10.3	12.7
1985	11.7	78.5	5.3	59.4	6.4	19.1
1986	13.5	92.0	1.6	61.0	12.0	31.1
Subtotal	92.0	--	61.0	--	--	--
Committed						
1987	8.4	8.4	1.0	1.0	7.4	7.4
1988	9.8	18.2	1.6	2.6	8.3	15.6
1989	9.6	27.8	1.5	4.1	8.0	23.7
1990	11.3	39.1	1.6	5.7	9.7	33.4
1991	10.7	49.8	1.6	7.3	9.1	42.5
1992	8.9	58.7	1.4	8.7	7.5	50.0
1993	9.1	67.8	1.4	10.2	7.7	57.6
1994	6.8	74.6	1.4	11.6	5.4	63.0
1995	6.0	80.7	.7	12.2	5.4	68.4
1996	4.9	85.6	.7	12.9	4.3	72.7
1997	3.4	89.0	0	12.9	3.4	76.1
1998	2.7	91.7	0	12.9	2.7	78.8
1999	2.1	93.8	0	12.9	2.1	80.9
2000 and Later	3.0	96.8	0	12.9	3.0	83.9
Subtotal	96.8	-	12.9	-	-	-
Total	188.8	--	73.9	--	--	--

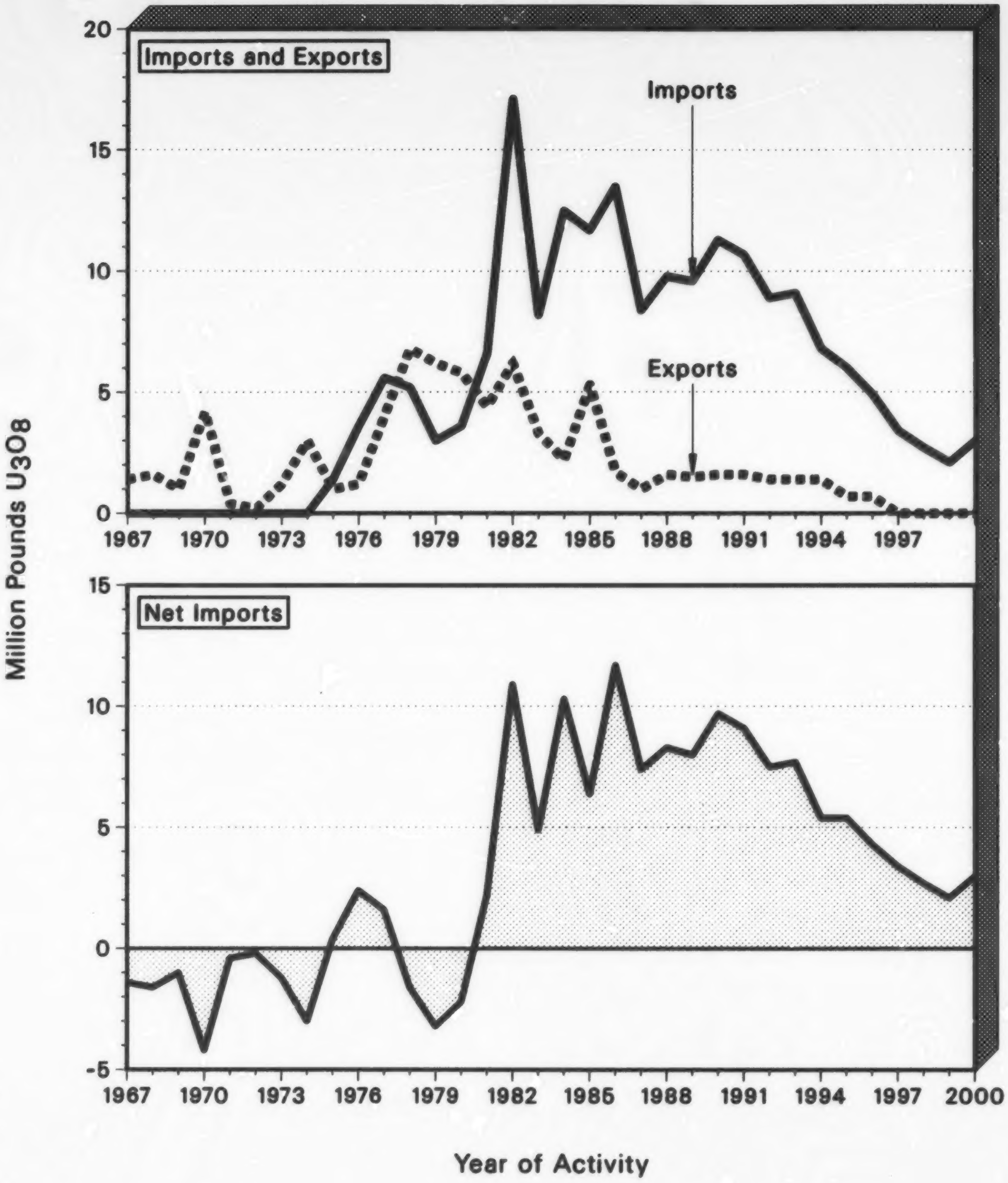
[a] Figures for 1968-1981 represent exports by uranium producers only.

--, Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1967-1983**--Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983*, DOE/EIA-0403(83) (Washington, DC, August 1984). **1984-1985**--Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986-Beyond 2000**--Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 27. Actual and Committed Imports and Exports of Uranium for Commercial Uses, 1967-2000 and Later



Note: Data plotted for the year 2000 include data for later years.

Source: See Table 40.

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The survey data show that of the 13.5 million pounds U_3O_8 imported in 1986, 6.3 million pounds were imported directly by 11 utilities; the remainder were imported by five suppliers. Of the material imported in 1986, 59 percent was of Canadian origin, and 41 percent was of South African and Australian origin. For import commitments for delivery from 1987 to beyond 2000, 56 percent are of Canadian origin, and 44 percent originate from other foreign countries.

"Export" refers to deliveries of domestic-origin uranium to foreign buyers by both domestic suppliers and domestic utilities. However, if the uranium is further processed in the United States, it may not actually leave this country for some time. From 1967 through 1986, domestic companies exported 61.0 million pounds U_3O_8. As of December 31, 1986, contracts were in place for exports of an additional 12.9 million pounds U_3O_8 from 1987 through 2000 and beyond. Deliveries to foreign buyers in 1986 totaled 1.6 million pounds.

Table 41 shows the history of contracting by U.S. companies for direct purchase of foreign-origin uranium. Since 1970, a total of 87 import contracts have been made for 155.9 million pounds U_3O_8. However, it should be noted that because of litigation, cancellations, and contract modifications, some of the originally scheduled commitments were not delivered to U.S. customers.

New Import Commitments

In 1986, the survey's import commitment data show that 15 new import contracts were signed for 22.1 million pounds of new uranium commitments. Spot market transactions (contracts signed in 1986 for delivery from 1986 through 1987) totaled 4.0 million pounds of uranium. The remaining 18.1 million pounds U_3O_8 will be delivered under long-term contracts starting in 1987 and extending beyond the year 2000. Of the new commitments contracted for in 1986, 10.3 million pounds are for imports from Canada, and 11.8 million pounds are reported to be from Australia.

Table 41. Commitments and Deliveries of Foreign-Origin Uranium, 1970-1986

Year of Contract Signing	New Contracts[a]		Actual Deliveries (million pounds U_3O_8)
	Number	Million Pounds U_3O_8	
1970	1	4.2	0
1971	0	0	0
1972	2	15.4	0
1973	1	2.2	0
1974	2	21.2	0
1975	5	9.2	1.4
1976	2	1.0	3.6
1977	1	3.0	5.6
1978	2	1.0	5.2
1979	1	1.6	3.0
1980	1	4.6	3.6
1981	4	9.8	6.6
1982	17	28.4	17.1
1983	8	6.2	8.2
1984	15	11.1	12.5
1985	10	14.9	11.7
1986	15	22.1	13.5
Total	87	[b]155.9	92.0

[a] These figures represent total new contractual commitments. Actual deliveries under these contracts are for the year of contract signing and/or future years.

[b] This figure does not match total imports shown in Table 40 due to cancellations and contract delivery modifications (i.e., increase or decrease in quantity from that originally specified in contracts signed prior to 1986).

Sources: 1970-1983–Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983*, DOE/EIA-0403(83) (Washington, DC, August 1984). 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Prices for Foreign-Origin Uranium

Table 42 shows the quantity-weighted average price paid by domestic customers for 1983 through 1986 deliveries of foreign-origin uranium. The price paid for 1986 deliveries averaged $20.07 per pound U_3O_8, approximately the same as the price for deliveries in 1985.

Deliveries to Enrichment Suppliers

The data in Table 43 show that 30.8 million pounds of uranium were delivered to enrichment suppliers in 1986. This quantity includes exchanges of natural uranium for enriched uranium. Of the 30.8 million pounds, 27.3 million pounds of uranium were delivered to DOE enrichment plants, consisting of 16.6 million pounds of domestic-origin material and 10.7 million pounds of foreign-origin material. Of the 10.7 million pounds from foreign sources, 8.4 million pounds were of Canadian origin, 1.9 million pounds were of South African origin, and 0.4 million pounds were from other foreign countries. A total of 3.4 million pounds was delivered to foreign enrichment plants. Table 44 shows projected feed deliveries to domestic and foreign enrichment plants for 1987 through 1996. The data show that projected feed deliveries for 1987-1995 decreased by 9.8 million pounds from those reported in the 1985 survey.

Table 42. Prices for Imported Uranium, 1983-1986
(Year-of-Delivery Dollars)

Item	1983	1984	1985	1986
Average Price (dollars per pound U_3O_8)	26.16	21.86	20.08	20.07
Amount of U_3O_8 for Which Price Data Were Reported (million pounds U_3O_8)	8.2	11.1	10.7	12.8
Amount of U_3O_8 Delivered (million pounds U_3O_8)	8.2	12.5	11.7	13.5
Percentage of Total Import Delivery Commitments With Reported Prices	100	89	91	95

Note: Prices shown are quantity-weighted averages.

Sources: 1983–Energy Information Administration, *Survey of United States Uranium Marketing Activity 1983*, DOE/EIA-0403(83) (Washington, DC, August 1984). 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 43. Shipments of Uranium by Utilities to Domestic and Foreign Enrichment Suppliers in 1986

(Million Pounds U_3O_8 Equivalent)

Type of Shipment	Domestic Uranium	Foreign Uranium	Total
To Domestic (DOE) Enrichment Plants	16.6	10.7	27.3
To Foreign Enrichment Plants	1.2	2.2	3.4
Total	17.8	12.9	30.8

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 44. Projected Shipments of Uranium by Utilities to Domestic and Foreign Enrichment Suppliers as of December 31, 1986

(Million Pounds U_3O_8)

Year of Shipment	Amount Shipped		Change From 1985 to 1986	
	As of December 31, 1985	As of December 31, 1986[a]	Annual	Cumulative
1987	33.9	35.9	2.1	2.1
1988	37.8	30.8	-7.0	-4.9
1989	39.5	37.9	-1.7	-6.6
1990	37.1	41.4	4.3	-2.3
1991	46.1	42.8	-3.3	-5.6
1992	43.3	42.3	-1.0	-6.6
1993	42.1	45.5	3.4	-3.2
1994	43.3	39.8	-3.5	-6.7
1995	45.6	42.5	-3.1	-9.8
1996	NR	47.0	--	--

[a] Amount shipped was estimated by EIA for one company. This company was unable to provide an estimate of their projected shipments for this survey.

NR, Not reported.

--, Not applicable.

Source: 1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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Inventories

Table 45 presents data on total U.S. commercial inventories of uranium as of December 31, 1984, 1985, and 1986. Inventories are subdivided into those held by all companies (utilities and suppliers) and those held only by utilities. The data are given in million pounds U_3O_8 equivalent, with the domestic and foreign-origin components of natural and enriched uranium inventories identified separately. These inventory figures include material in the processing stream, as well as material in storage.

Table 45. Commercial Uranium Inventories at End of Year 1984, 1985, and 1986
(Million Pounds U_3O_8 Equivalent)

Item	Utilities			All Companies		
	1984	1985	1986	1984	1985	1986
Natural U_3O_8						
Domestic	31.5	R24.8	30.6	54.5	R45.0	51.6
Foreign	14.7	11.3	6.6	15.6	13.3	10.1
Total	46.2	36.1	37.2	70.1	R58.2	61.7
Natural UF_6						
Domestic	34.2	R23.2	18.7	34.3	R23.3	18.9
Foreign	7.6	R10.6	6.9	7.6	R10.6	7.0
Total	41.9	R33.7	25.6	41.9	R33.9	25.9
Natural UF_6 Under Usage Agreements						
Domestic	8.2	R15.4	16.8	8.2	R15.4	16.8
Foreign	0.4	R3.0	3.6	0.4	R3.0	3.6
Total	8.6	18.4	20.4	8.6	18.4	20.4
UF_6 at Enrichment Suppliers						
Domestic	14.5	R10.2	13.2	14.5	R10.3	13.2
Foreign	5.8	R4.9	5.7	5.8	R4.9	5.7
Total	20.3	15.1	18.9	20.3	15.2	18.9
Enriched UF_6						
Domestic	15.2	R19.5	11.1	16.2	R20.3	11.5
Foreign	4.0	R5.1	6.3	4.0	R5.6	6.8
Total	19.2	R24.6	17.4	20.2	R26.0	18.3
Fabricated Fuel						
Domestic	21.8	R22.2	20.4	21.8	R22.2	20.4
Foreign	2.2	R3.0	5.1	2.2	R3.0	5.1
Total	24.0	R25.2	25.5	24.0	R25.2	25.5
Total Inventories						
Domestic	125.5	R115.3	110.8	149.5	R136.6	132.5
Foreign	34.8	R37.8	34.2	35.7	R40.3	38.2
Total	160.2	R153.2	144.9	185.2	R176.9	170.7

R, Revised data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Total commercial inventories decreased by 6.2 million pounds, from 176.9 million pounds U_3O_8 as of December 31, 1985, to 170.7 million pounds as of December 31, 1986. Utility inventories decreased by 8.3 million pounds -- from 153.2 million pounds as of December 31, 1985, to 144.9 million pounds as of December 31, 1986. Of the 57 utilities responding to the survey, 26 reported increases in inventories, 22 reported decreases, and 9 reported virtually no changes in their total inventory levels. Table 46 shows the distribution of inventories held by utilities. Of the 57 utilities responding to the survey, 52 held inventories of natural U_3O_8, 34 held inventories of natural UF_6, 36 held fabricated fuel, and 30 had UF_6 under usage agreements.

Twenty-four suppliers reported uranium inventories totaling 25.7 million pounds U_3O_8 equivalent as of December 31, 1986. Six companies held approximately 75 percent of the total inventories reported by all suppliers.

Table 46. Characteristics of Utility Uranium Inventories as of December 31, 1986

Item	Inventory Size Range (thousand pounds U_3O_8 equivalent)	Number of Utilities	Total Amount of Uranium Held (million pounds U_3O_8 equivalent)
Natural U_3O_8	0	5	0
	1-500	28	3.8
	501-1,000	10	6.7
	Over 1,000	14	26.7
	Total	57	37.2
Natural UF_6	0	23	0
	1-500	20	3.2
	501-1,000	8	6.2
	Over 1,000	6	16.2
	Total	57	25.6
Natural UF_6 Under Usage Agreements	0	27	0
	1-500	10	1.6
	501-1,000	13	8.1
	Over 1,000	7	10.6
	Total	57	20.4
UF_6 at Enrichment Suppliers	0	8	0
	1-500	37	4.9
	501-1,000	8	6.3
	Over 1,000	4	7.7
	Total	57	18.9
Enriched UF_6	0	23	0
	1-500	19	3.9
	501-1,000	11	8.1
	Over 1,000	4	5.4
	Total	57	17.4
Fabricated Fuel	0	21	0
	1-500	22	5.5
	501-1,000	10	7.1
	Over 1,000	4	13.0
	Total	57	25.5
Total Inventories		57	144.9

Note: Totals may not equal sum of components due to independent rounding.
Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Table 47 provides data on the total inventories of commercially owned and Government-owned natural and enriched uranium held in the United States as of December 31, 1984, 1985, and 1986. This includes the previous information on utility and domestic supplier inventories, as well as DOE-owned natural and enriched uranium. DOE's inventory of natural uranium increased from 69.9 million pounds in 1985 to 76.2 million pounds in 1986. The amount of enriched uranium held in inventory by DOE decreased by 9.1 million pounds, from 76.4 million pounds to 67.3 million pounds. DOE-owned material is planned for use through the mid-1990's as working and strategic inventories at enrichment plants and for meeting the long-term requirements of U.S. Government programs.

Figure 28 shows U.S. commercial inventories of natural and enriched uranium as of December 31, 1986, compared with scheduled utility enrichment feed deliveries for 1987 through 1991. The inventories at end of year 1986 are equivalent to more than 4 years of forward coverage for utility enrichment feed deliveries.

Table 47. Inventories of Commercial and U.S. Government-Owned Natural and Enriched Uranium as of End of Year 1984, 1985, and 1986

(Million Pounds U_3O_8 Equivalent)

Item	Inventories at the End of the Year		
	1984	1985	1986
Utility Stocks			
Natural Uranium	96.7	R88.2	83.1
Enriched Uranium	63.5	64.9	61.8
Domestic Supplier Stocks			
Natural Uranium	24.0	R22.3	24.8
Enriched Uranium	1.0	R1.4	.9
Total Commercial Stocks	185.2	R176.9	170.7
DOE-Owned Stocks			
Natural Uranium	[a] 74.4	69.9	76.2
Enriched Uranium	78.0	76.4	67.3

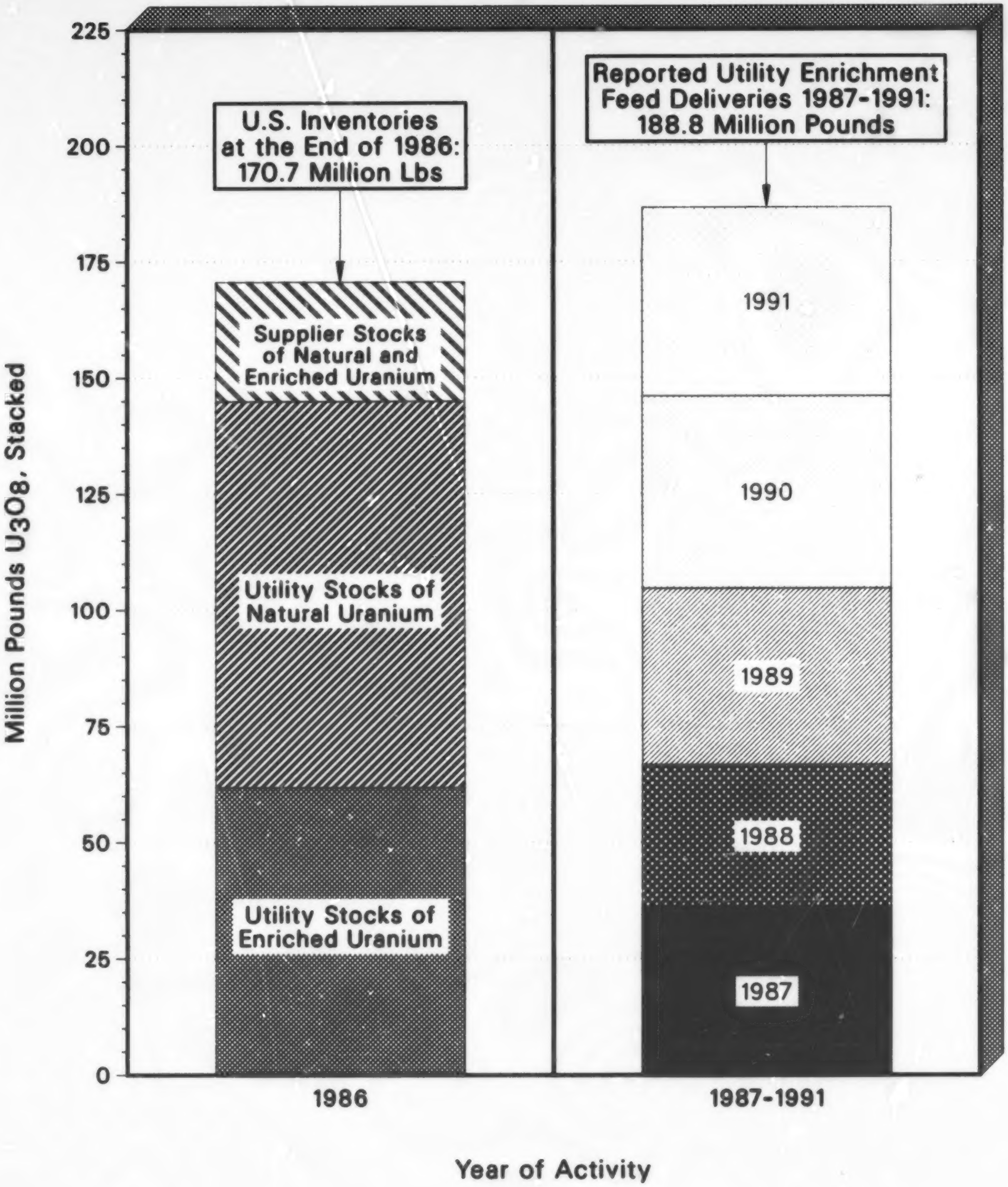
[a] 1984 DOE-owned stocks were reported as of September 30, 1984. Stocks for 1985 and 1986 are reported as of December 31 of the respective years.

R, Revised data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1984-1985**–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). **1986**–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986). **1984-1986, DOE-owned uranium only**– Office of the Assistant Secretary for Nuclear Energy, U.S. Department of Energy.

Figure 28. Inventories of Uranium and Utility Enrichment Feed Deliveries, 1987-1991, as of December 31, 1986



Sources: See Tables 47 and 49.

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Secondary Market Activities

Secondary market activities include sales, loans, and exchanges of uranium other than direct sales from a domestic supplier to a U.S. utility or an import by a U.S. utility. In 1986, interutility transactions were low, totaling 0.5 million pounds U_3O_8 equivalent.

In 1986, U.S. utilities exchanged 2.3 million pounds of natural uranium with domestic suppliers and brokers for enriched uranium. An additional 0.4 million pounds of natural uranium were exchanged with domestic suppliers and brokers for natural uranium. U.S. utilities sold 0.1 million pounds U_3O_8 equivalent to domestic suppliers in 1986, bringing the total for all secondary transactions between domestic utilities and suppliers to 2.8 million pounds. Intersupplier sales in 1986 totaled 10.3 million pounds U_3O_8 equivalent.

Total secondary market transactions in 1986 were approximately 13.6 million pounds, which is exactly the same volume of secondary market transactions as in 1985.

Apparent Uranium Market Requirements of Domestic Utilities

Unfilled Uranium Requirements

Unfilled requirements are additional natural uranium purchase needs of utilities after consideration of their total future enrichment feed delivery requirements, less inventories and deliveries under existing procurement contracts. Unfilled requirements also include purchases necessary to maintain a "desired" level of inventory coverage.

Table 48 lists the annual unfilled uranium requirements for reactors in operation, under construction, or on order, as reported by domestic utilities as of December 31, 1984, 1985, and 1986. Total unfilled requirements for 1987 through 1996 are reported, as of the end of 1986, to be 190.6 million pounds U_3O_8. Unfilled requirements for the period 1987 through 1995 show a slight decrease, from 169.6 million pounds reported at end-of-year 1985 to 162.1 million pounds reported at end-of-year 1986. Of the 57 utilities responding to the survey, 44 reported that they had unfilled market requirements for uranium in the years 1987 through 1996.

Table 48. Unfilled Uranium Requirements of Utilities
(Million Pounds U_3O_8)

Year	As of December 31, 1984		As of December 31, 1985		As of December 31, 1986	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1987	6.8	6.8	5.9	5.9	3.8	3.8
1988	10.3	17.1	10.6	16.5	6.1	9.9
1989	14.0	31.1	13.3	29.8	13.8	23.7
1990	16.1	47.2	13.4	43.2	13.3	37.0
1991	18.4	65.6	21.3	64.6	22.1	59.0
1992	22.4	88.0	20.4	85.0	20.6	79.7
1993	24.8	112.8	25.2	110.2	25.4	105.1
1994	26.8	139.6	30.5	140.7	28.7	133.8
1995	NR	NR	28.8	169.6	28.3	162.1
1996	NR	NR	NR	NR	28.5	190.6

NR, Not reported.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 1984-1985–Energy Information Administration, *Uranium Industry Annual 1985*, DOE/EIA-0478(85) (Washington, DC, November 1986). 1986–Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Uranium Requirements

Data from various parts of this chapter are combined in Table 49 to produce an aggregate picture of some aspects of U.S. uranium requirements. Apparent market requirements (Column 3) are computed by summing utility receipts of natural uranium (Column 1) and unfilled requirements (Column 2). Utility receipts of natural uranium include firm and optional domestic purchase commitments and imports.

The three components of apparent utility requirements are shown in Figure 29. Unfilled requirements constitute a small portion of apparent utility requirements through 1988, but by 1989 they account for 41 percent of total apparent requirements, rising to 67 percent in 1996.

Also shown in Figure 29 is the schedule reported by utilities for enrichment feed deliveries to their enrichment suppliers. It appears that, for most of the years 1987 through 1996, utilities plan to meet a portion of their enrichment deliveries by drawing down natural uranium inventories.

Figure 30 shows the projected end-of-year inventories of natural uranium for U.S. utilities in comparison with their projected schedule of enrichment feed deliveries. Projected inventories of natural uranium are based on the following relationship:

Projected Inventories of Natural Uranium
= Previous Year's Inventories
+ Apparent Market Requirements
(Purchases + Unfilled Requirements)
+ Loans From Nonutilities
- Loan Repayments to Nonutilities
- Sales Commitments to Nonutilities
- Enrichment Feed Deliveries .

Natural uranium inventories generally are projected to decline from 1987 through 1996, which is consistent with the comments above concerning a drawdown of natural uranium inventories.

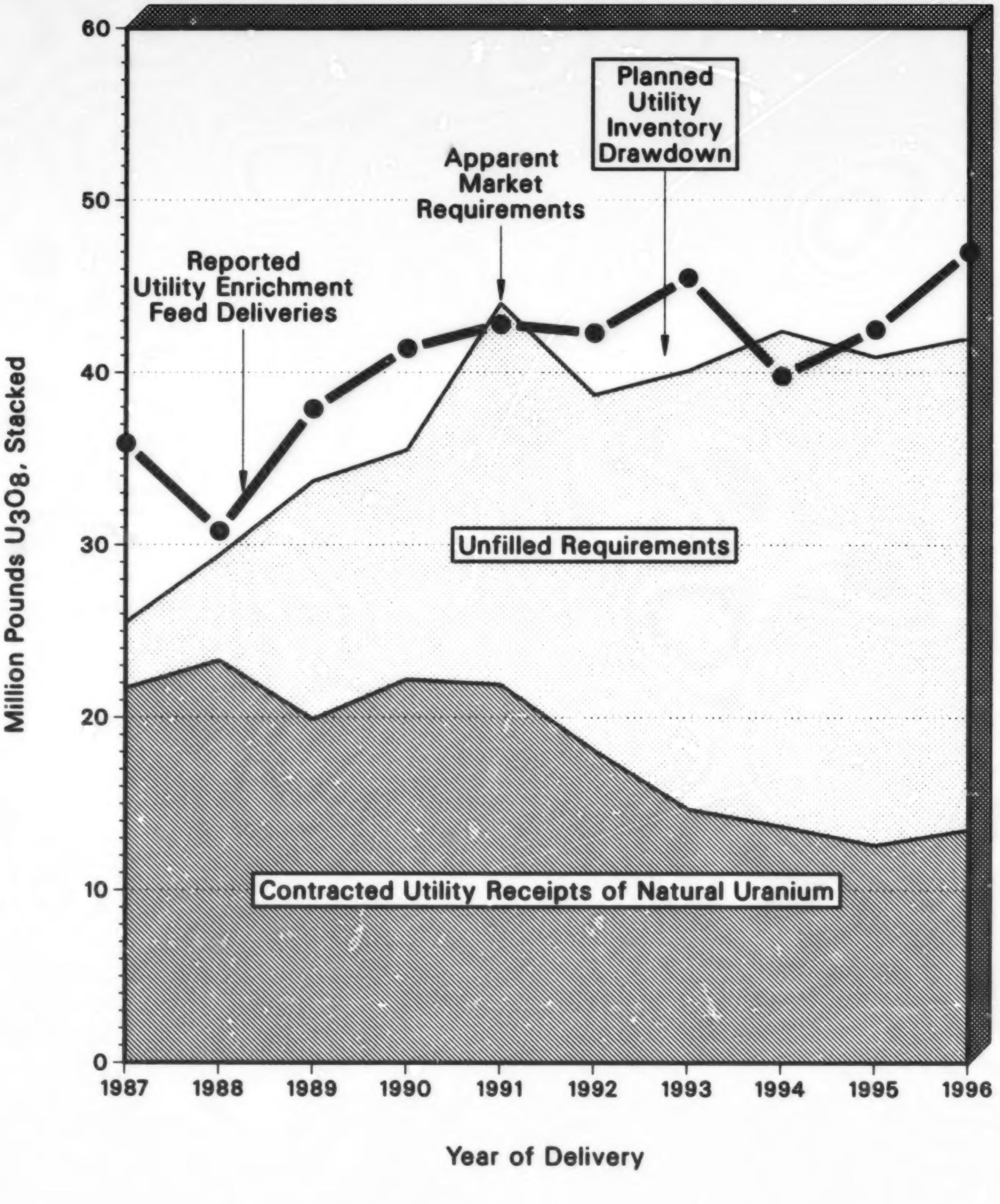
Table 49. Apparent Uranium Market Requirements of Utilities, 1987-1996, as of December 31, 1986
(Million Pounds U_3O_8)

Year of Delivery	1. Contracted Utility Receipts of Natural Uranium[a]	2. Unfilled Requirements	3. Apparent Market Requirements	4. Reported Utility Enrichment Feed Deliveries
1987	21.7	3.8	25.5	35.9
1988	23.3	6.1	29.5	30.8
1989	19.9	13.8	33.7	37.9
1990	22.2	13.3	35.5	41.4
1991	21.9	22.1	44.0	42.8
1992	18.1	20.6	38.7	42.3
1993	14.7	25.4	40.1	45.5
1994	13.7	28.7	42.3	39.8
1995	12.9	28.3	41.2	42.5
1996	13.8	28.5	42.3	47.0

[a] Expected receipts for contracts in place as of December 31, 1986. Excludes certain optional purchase commitments that were calculated to be in excess of reported utility needs.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 29. Apparent Uranium Market Requirements of Utilities, 1987-1996, as of December 31, 1986



Source: See Table 49.

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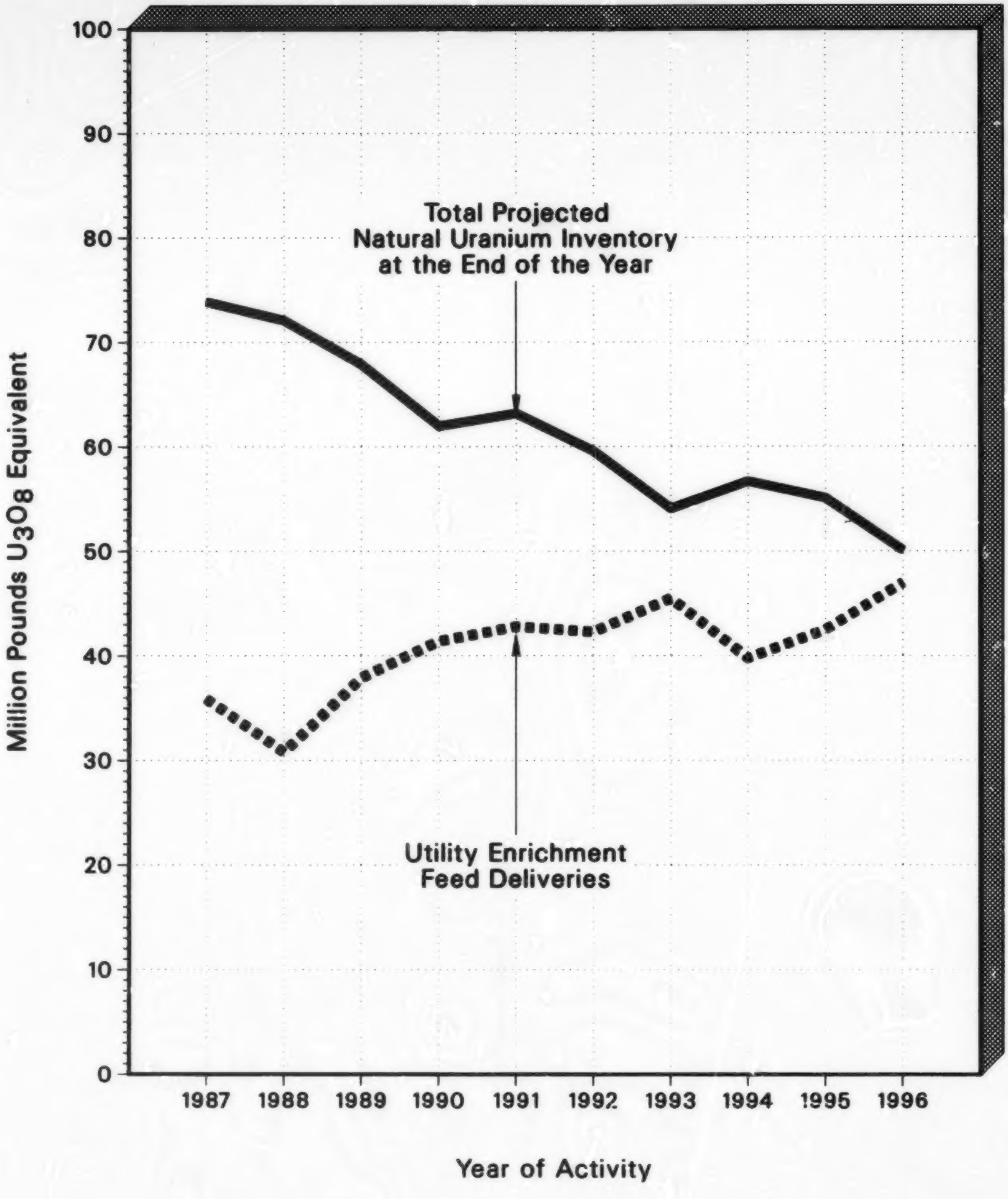
Figure 30. Planned Disposition of Natural Uranium Inventories by Utilities, 1987-1996, as of December 31, 1986



Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1985).

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Uranium Available for Sale by Domestic Suppliers

Table 50 shows the amount of uncommitted uranium available for sale by domestic suppliers at $10 price increments from $20 per pound or less to $60 per pound or less and more than $60 per pound as of December 31, 1986. For the period from 1987 through 1996, 32 domestic suppliers reported having a total of 172.8 million pounds U_3O_8 available for sale as of December 31, 1986. Most of this uranium (130.6 million pounds U_3O_8) is available for sale at $40 per pound or less.

Figure 31 shows U_3O_8 available for sale by U.S. suppliers in $10 price increments starting at $20 per pound, by year of delivery. The price increment is in January 1987 dollars. Prices of $50 per pound or less would bring forth sufficient domestic production to meet unfilled requirements on an annual basis through 1990. Prices of $60 per pound or less would be required for domestic production to meet a major portion of unfilled requirements for 1991 and beyond.

Table 50. Uncommitted Uranium Estimated by Domestic Suppliers as Being Available for Sale as of December 31, 1986, by Year of Sale and Price Category
(Million Pounds U_3O_8)

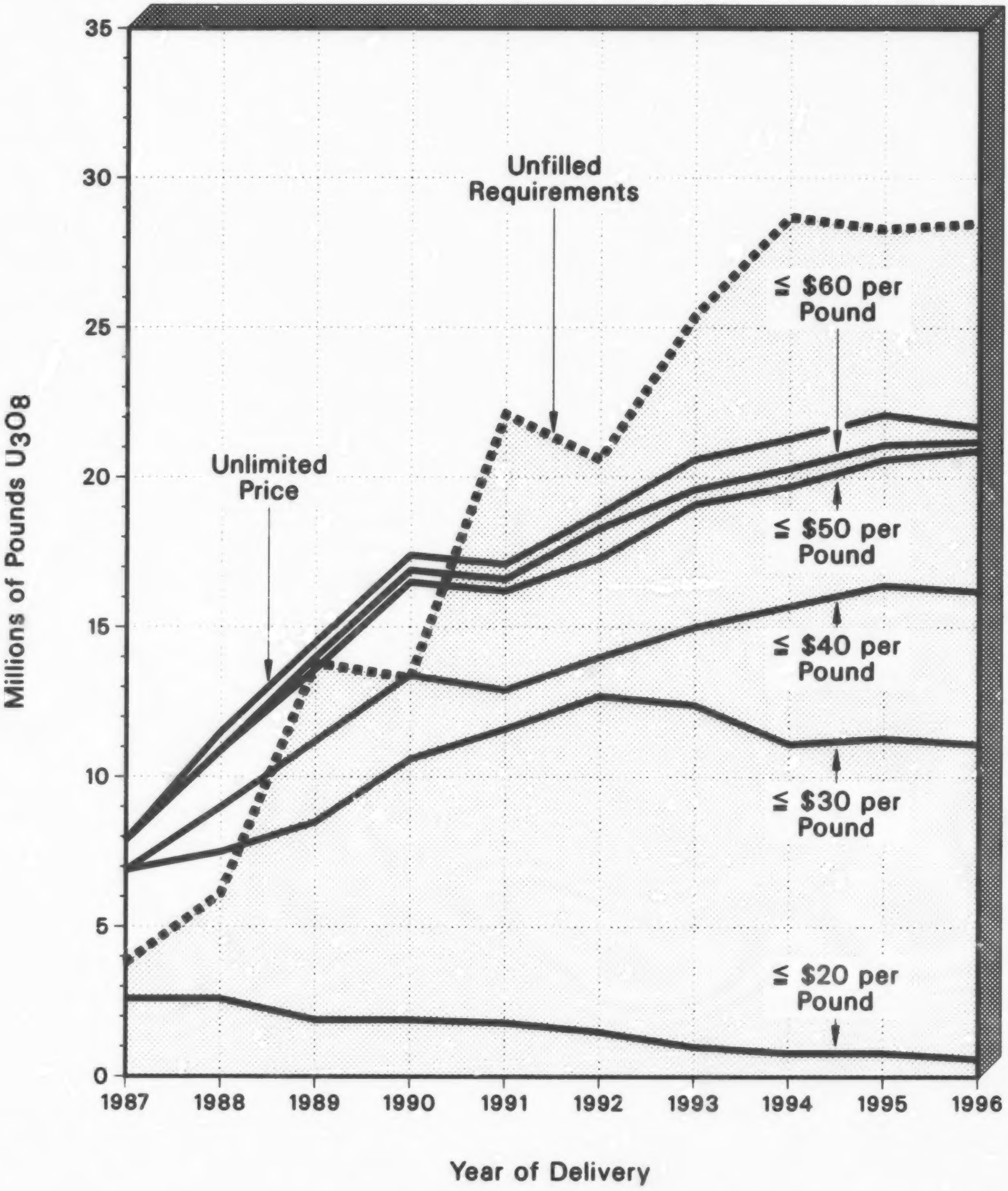
Year of Sale	Price Category[a]					
	$20 per Pound or Less	$30 per Pound or Less	$40 per Pound or Less	$50 per Pound or Less	$60 per Pound or Less	More Than $60 per Pound
1987	2.6	6.9	6.9	7.9	7.9	7.9
1988	2.6	7.5	9.0	10.9	10.9	11.5
1989	1.9	8.5	11.2	13.6	14.0	14.5
1990	1.9	10.6	13.4	16.5	16.9	17.4
1991	1.8	11.6	12.9	16.2	16.6	17.1
1992	1.5	12.7	14.0	17.3	18.3	18.8
1993	1.0	12.4	15.0	19.1	19.6	20.6
1994	.8	11.1	15.7	19.7	20.3	21.3
1995	.8	11.3	16.4	20.6	21.1	22.1
1996	.6	11.1	16.2	20.9	21.2	21.7
Total	15.6	103.6	130.6	162.6	166.7	172.8

[a] Prices are in constant January 1987 dollars.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

Figure 31. Uncommitted Uranium Available for Sale, 1987-1996, as of the End of 1986



Note: Prices are in constant January 1, 1987 dollars.

Source: See Table 49 and Table 50.

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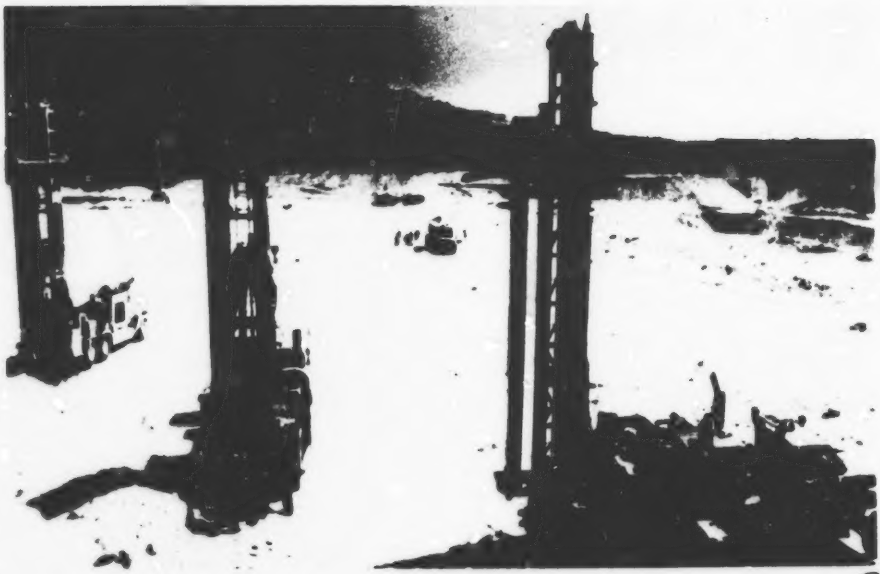
Appendix A

Survey Methodology



Drilling operations to develop additional ore at an openpit uranium mine.

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Appendix A

Survey Methodology

Survey Design

Form EIA-858, "Uranium Industry Annual Survey," is the third comprehensive survey of the United States uranium industry conducted by the Energy Information Administration (EIA). Data were collected from all companies thought to be or to have been involved in the U.S. uranium industry. The survey form was mailed to these firms in January 1987. A mid-year supplement, covering marketing activities in the first half of 1987, was mailed in July 1987 to all companies reporting uranium marketing activities for the 1986 survey year. The data reported in this publication were developed from the January Form EIA-858 and predecessor data systems. The data from the mid-year survey are summarized and reported in a speech entitled "Uranium Industry Annual" presented each year to the Council on Energy Awareness Uranium Seminar.

Respondents to the "Uranium Industry Annual Survey" were asked to provide data current to the end of 1986 about the following: uranium raw materials activities (including land holdings, exploration and development activities, uranium-bearing properties and resources, uranium mines, uranium processing facilities, and uranium industry employment for exploration, mining, milling, and processing); uranium marketing activities (including contracts, contract prices, delivery schedules, uranium inventories, and material available for sale); and the uranium industry's financial status (including current and noncurrent assets, current and long-term debt, stockholders' equity and other liabilities, sources and uses of funds, planned capital expenditures, operating revenues, and operating expenses).

As in all surveys, data from the "Uranium Industry Annual Survey", are subject to various sources of error. These sources are: (1) coverage (e.g. the list of respondents may not be complete or on the other hand, there may be doublecounting), (2) nonresponse (all units that are surveyed may not respond or may not provide all the information requested), (3) respondent (respondents may commit errors in reporting the data), (4) processing (e.g. the data collection agency may lose or incorrectly transcribe the submissions), (5) concept (the data collection elements may not measure the items they were intended to measure), and (6) adjustment (e.g. there may be errors made in estimating values for missing data).

Because the "Uranium Industry Annual Survey" is not a sample survey, the estimates shown in this report are not subject to sampling error (a measure of the variation that occurs by chance because a sample rather than a complete enumeration of units is surveyed). Although it is not possible to present estimates of nonsampling error, precautionary steps were taken at each stage of the survey design to minimize the possible occurrence of these errors. The steps are described below with the error they were designed to minimize shown in parenthesis.

Survey Universe and Frame (Steps to Minimize Coverage Errors)

The survey universe was intended to approach a census of those companies involved in the U.S. uranium industry. The universe includes all firms meeting one or more of the following criteria: (1) are controllers or were controllers during any portion of 1986, or are identified in EIA records as the most recent controllers, of uranium properties, mines, mills, or plants; (2) involved as controllers of uranium exploration and development ventures in the United States; (3) incurred uranium exploration expenditures in 1986 or plan such expenditures in 1987; (4) hold economic or subeconomic uranium reserves; (5) control uranium mining properties; (6) control commercial uranium extraction operations; (7) purchase, sell, or own domestic- or foreign-origin uranium. (See Form EIA-858 in Appendix D for a comprehensive delineation of these seven categories.)

The respondent list used for the Form EIA-858 survey was developed from a frame of all establishments known to meet the selection criteria for involvement in any facet of the U.S. uranium industry. The frame of potential respondents was compiled from previous surveys and from information in the public domain.

The frame was intended to cover the following: all utilities owning nuclear-fueled generating stations; large and small companies actively engaged in exploration, development, or exploitation in the U.S. uranium industry; and companies holding all large properties with uranium-bearing reserves. Companies meeting these criteria include: those involved in exploration, development, mining, milling, and trading of uranium; landowners, fuel converters, and fabricators; and utilities with whole or partial ownership in operating or planned uranium-fueled power plants.

Survey Procedures (Steps to Minimize Nonresponse)

The survey forms were sent via certified mail to ensure their receipt only by the proper respondent organization and to ascertain the correct mailing address. If the U.S. Postal Service was unable to deliver the survey form, the corrected address was obtained where possible. In a few instances, businesses that had reported in earlier surveys were no longer operating and therefore were identified as out of scope for this survey. All companies currently conducting business in the U.S. uranium industry were contacted for this report.

Form EIA-858, "Uranium Industry Annual Survey," is a self-administered questionnaire requesting data about many areas of company operations and finances. The scope of the questions is necessarily broad, and self-reporting of company specific data is required.

The cooperation of the industry with this year's survey was, as with previous years, excellent. Most companies replied to the questionnaire within the specified deadlines. Ten days after each section was due, followup telephone calls were initiated to encourage timely submission of these data. These calls resulted in the submission of most of the remaining forms. Additional telephone calls, and then a letter mailed about 1 month after the forms were due, were also used to obtain the completed forms. In a few instances, company data were collected through telephone conversations, followed by submissions of the survey forms.

In order to reduce the burden to the respondents, every effort was made to identify the properties, mines, mills, and long-term contracts that form the bulk of responses to the 1986 survey. Selected data elements reported by industry companies on the previous year's forms were preprinted on the 1986 Form EIA-858 in order to simplify the process by which respondents complete and verify the requested data.

Data Editing, Analysis, and Processing (Steps to Minimize Respondent and Processing Errors)

The survey forms are logged in and reviewed by agency personnel prior to key entry into the Uranium Industry Annual System, an automated data base containing all current and historical data from each company's submissions. The data base is maintained on the EIA computing facility in Washington, DC. After entry into the data base, a copy of each section of the Form EIA-858 was distributed to the Nuclear and Alternate Fuels Division analyst responsible for that section. The submissions were checked for internal consistency, and the reported data were compared to previous collections of similar data. After reviewing these submissions, the analyst consulted with the reporting company, as needed, to resolve data problems and to confirm any revision of the data. Data areas that were reviewed and the revisions that were made differed significantly from company to company. Most represented different interpretations of the data item definitions. No data in the data base were revised without first consulting with the reporting company. Computer edits were also used to identify keypunch errors, misinterpretation of these data by the coders or keypunchers, out-of-range codes, and unlikely data combinations. These were also either corrected to represent the data reported on the submissions or were revised only after confirming the corrected values by telephone conversations with company representatives. All changes to reported data are documented.

Response Rates

Schedules A and B of Form EIA-858 were mailed to 173 firms, and Schedule C was mailed to 51 firms. The response statistics for the 1986 survey are shown in Table A1. Overall, 100 percent of the schedules that were mailed to industry companies were returned with the data requested on the form or marked as not applicable to the company for this survey year.

Missing Data

Some omissions of data were identified during the prescreening and editing of the data. Most missing data items represented data that were not available to the companies in their data files, were too old (i.e., dated) to be useful for analysis, or were withheld because of contractual constraints or contracts that were under litigation. Respondents were contacted by telephone regarding the missing data items to verify that these data items could not be reported. Only confirmed company-reported data are contained in the data base and included in this report. The sole exception to this rule is the imputation of contract prices (see Appendix B).

Nondisclosure of Data

In order to protect the confidentiality of individual respondents' data, a policy was implemented to ensure that the reporting of survey data in this publication would not identify those data as belonging to a particular company. This is in compliance with EIA Standard No. 84-3-04, "Standard for Nondisclosure of Company Identifiable Data in Aggregate Cells." If fewer than three companies are identified as reporting data in a cell of a table, or if a single company so dominates the cell that the publication of the data in that cell would lead to the identification of that company, the EIA reports the value of that cell as withheld, or "W." In addition, data in other cells may also have been withheld so that the contents of the sensitive cells could not be computed from the totals for all cells.

Table A1. Response Statistics for the 1986 Uranium Industry Annual Survey

Response Status	Schedule		
	A	B	C
Survey Schedules Mailed Out	173	173	51
Data Provided	93	98	35
Data Provided Through Parent or Subsidiary	1	1	0
Reported as Not Applicable[a]	79	74	16

[a] Includes respondents stating that in 1986 the company did not meet any of the criteria for inclusion in the survey.

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Appendix B

Technical Notes

Surface installation at an underground uranium mine. The headframe (at left) over the mine shaft supports the system for lifting ore from the mine.

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Appendix B

Technical Notes

Estimation of Resources and Reserves

This section discusses the methods used to estimate the U.S. uranium resource base. The five resource categories used to report estimates of domestic uranium resources are Reasonably Assured Resources (RAR), Estimated Additional Resources (EAR), Speculative Resources (SR), Economic Reserves, and Subeconomic Reserves. Estimates of resources reported for the RAR, EAR, and SR categories were derived utilizing the Department of Energy (DOE) resource estimation methodologies for reserves and undiscovered resources at selected forward-cost categories, as described below. The estimates of Economic Reserves and Subeconomic Reserves are aggregations of data reported by individual uranium companies according to criteria formulated to reflect current contracts and market conditions. The methodologies associated with each of the above resource categories are described below.

Appraisal of Undiscovered Resources

The appraisal of the Nation's undiscovered resources of uranium, which comprise the EAR and SR categories, is based on extensive data collected during the past 38 years under the uranium procurement and resource appraisal programs of DOE and its predecessor agencies. These data include: analyses of company-supplied gamma-ray logs of drill holes; chemical assays of core samples; data from geochemical surveys of groundwater and stream water and sediment; aerial radiometric surveys; limited selective drilling to fill voids in subsurface information; and extensive geological studies of field areas throughout the United States.

Through evaluation and integration of the data from field studies, as well as from mathematical and geological models of known uranium deposits (control areas), an estimate of the uranium endowment is calculated for each geologically favorable setting delineated. The uranium endowment, for a given geographical area under study, is an estimate of all uranium-bearing material with a grade of at least 0.01 percent U_3O_8 postulated to occur in that setting. This estimate is made before any consideration of the economics of exploration and exploitation. It therefore includes undiscovered resources (EAR and SR), as well as associated additional material at or above the 0.01 percent cutoff grade within the area for which the estimate is made.

In the estimation of undiscovered resources, economic factors for discovering, mining, and milling the undiscovered deposits in the favorable area are determined, and the costs are computed considering information about deposit location, depth, and other parameters. Computer-based models are used to determine operating costs for mining, hauling, milling, severance and *ad valorem* taxes, royalty, and capital costs for land acquisition, exploration, development, mining, and milling. All costs are forward costs -- that is, costs that have not yet been incurred. The cost factors are used to calculate average and cutoff grades that are expected to be economic for the $30, $50, and $100 per pound U_3O_8 category in each favorable area. A grade-tonnage relationship, usually derived from the selected control area, is also needed for the calculation of economic undiscovered resources. The grade-tonnage relationship is used to define a probability distribution for various grades, which in turn is used to develop a probability statement about the quantity of resources likely to meet or exceed the grade criteria.

U.S. Reasonably Assured Resources

Uranium reserves, expressed as Reasonably Assured Resources (RAR), are the estimated quantities of uranium which occur in known deposits of such grade, quantity, configuration, and depth that they can be recovered at or below a specified cost with state-of-the-art mining and processing technology. RAR are based on direct radiometric and chemical measurements of drill holes and other types of sampling of deposits. Mineral grades and thickness, spatial relationships, depths below the surface, mining and reclamation methods, distances to milling facilities, and amenability of ores to processing are considered in the evaluation. The amounts of uranium in ore that could be exploited within specified forward-cost levels are estimated according to conventional engineering practices, utilizing available engineering, geologic, and economic data. Uranium reserves estimated by the DOE have been adjusted for mining dilution and recovery. Losses for milling processes have not been deducted.

The costs used to categorize uranium resources are forward costs (operating and capital costs) in current (year of estimate) dollars, that would be incurred in producing the uranium. The costs indirectly cover power and fuel, labor, materials, royalties, payroll, severance and *ad valorem* taxes, insurance, and applicable general and administrative costs. All previous expenditures (before the time of the estimate) for such items as property acquisition, exploration, mine development, and mill construction are excluded. Also excluded are income taxes, profit, and the cost of money. The forward-cost categories are independent of the market price at which the uranium might be sold.

In estimating reserves for developed properties, land acquisition and exploration costs commonly are past expenditures and thus are excluded from the cost estimates. Conversely, in estimated additional and speculative resources for undeveloped areas, expenditures for these activities usually are included in the cost estimates, because they are costs yet to be incurred.

Reasonably Assured Resources (RAR) Estimating Procedure for 1964-1983

Estimates of U.S. uranium reserves in the period 1964-1983 were made by the DOE using data voluntarily provided by uranium companies to DOE's Grand Junction Area Office. Reserves were estimated for each property individually and were based on available data from samples, drill holes, and property maps. The amounts of uranium in ore that could be produced from a property at maximum forward costs of $15, $30, $50, and $100 per pound U_3O_8 were estimated by the general procedure outlined below. This procedure was applied to the estimates of reserves to be recovered by openpit, underground, and *in situ* leaching operations.

1. The cutoff grade was determined, in order to define the lowest grade (in percent U_3O_8) of material that could be mined from a property at a minimum thickness, where the total operating cost per pound of recoverable U_3O_8 in such material would be equal to the chosen cost ($15, $30, $50, or $100) per pound. The cutoff grade was determined by the following formula:

$$CG = \frac{(Mn + H + R + Ml)(100)}{(CC)(Mr)(2,000)}$$

where:

CG = cutoff grade in percent,
Mn = cost of mining per ton of ore,
H = cost of hauling per ton of ore,
R = royalty costs per ton of ore,
Ml = cost of milling per ton of ore,
CC = chosen cost per pound U_3O_8, and
Mr = mill recovery rate (ratio).

2. The quantity of mineralized material in the deposit that met or exceeded the cutoff grade and thickness criteria was estimated, in tons of material and average grade adjusted for mining recovery and dilution.
3. All forward operating and capital costs not yet incurred were applied to determine the average cost for mining and processing per pound U_3O_8.
4. If the average cost per pound U_3O_8 derived in step 3 was equal to or less than the chosen cost category, the material was assigned to that cost category.

The procedures described above applied to reserves suitable for conventional mining. The quantities of U_3O_8 estimated to be recoverable from solution *(in situ)* mining operations are included in reserves totals but were estimated by another method. *In situ* reserves above a selected minimum thickness were calculated for those properties on which solution mining was in progress or was planned. The uranium content (above 0.01 percent U_3O_8) was estimated for each property, and the reserves were determined by multiplying the estimated amount of U_3O_8 by a recovery factor.

RAR Estimating Procedure for the End of 1984, 1985, and 1986

The RAR estimates made prior to the end of 1984 were derived from drillhole data and other engineering data made available by uranium companies to the Grand Junction Area Office (GJAO) of the Department of Energy. During 1983-1984, this type of data collection and resource estimation was phased out. EIA estimates of RAR for the end of 1984, 1985, and 1986 were made by adjusting the RAR estimates made as of December 31, 1983. Appropriate volumes of RAR were added in 1984 as estimates of RAR for properties not previously included in the GJAO data base, and residual volumes of RAR for mines reported as mined out during 1984, 1985, and 1986 were subtracted from the December 31, 1983, estimates. These subtractions also included annual U_3O_8 mine production (i.e., U_3O_8 extracted from the ground, and "depletions" that resulted in the erosion of ore no longer available at each forward-cost level as a result of the extraction of lower cost resources).

Domestic Economic Reserves

For 1986, Form EIA-858, "Uranium Industry Annual Survey," required respondents to report estimates of reserves as of December 31, 1986, providing data on the quantities of ore (thousand tons) and contained U_3O_8 (thousand pounds). The term "economic ore reserves" was explained on the survey form as follows:

> *Domestic economic ore reserves are defined as those that occur in known mineral deposits located in the United States of such size, grade and configuration that they reasonably could be expected to be recoverable at or below specified production costs with currently proven mining and processing technology and under current law and regulations. Estimates of the quantities of uranium, ore grades, and deposit configurations are based on specific sample data and measurements of the deposits and knowledge of deposit characteristics. Production costs mean future costs that would have to be incurred to produce the uranium in the form of U_3O_8 concentrate.*
>
> *Economic reserves generally are those reserves with the highest probability of occurrence (known variously as discovered reserves, proven reserves, or ore reserves) that are recoverable at a profit and the profit is based either on current contracts or on current market conditions.*

The survey did not specify categories of production costs for the reporting of economic reserves, because production costs differ from company to company. For each reserve quantity reported, however, data for attendant operating and capital costs were requested.

Estimates of subeconomic reserves also were requested on the 1986 Form EIA-858. This category of reserves was defined on the survey form as follows:

> *Subeconomic reserves conform to the above definition of economic reserves with the exception that their specified production costs exceed the costs currently considered economic and render unprofitable the exploitation of these reserves. The resources/reserves: (1) could have been defined some time prior to the current year, (2) were determined initially to be subeconomic, or (3) were determined initially to be economic and have since become subeconomic in light of current market conditions.*

Because this procedure differed from that used in prior surveys of the industry, some respondents requested an interpretation of the definition of economic and subeconomic reserves from EIA survey staff. In some cases, the survey staff assisted respondents in applying the definition to the respondent's particular situation; but in all cases the final estimation of reserves was approved by the respondent with respect to that company's long-term contracts and mining costs.

Procedure for Estimating Missing Market Price Data

This section describes the procedures used to develop price estimates for respondents who did not report uranium purchase prices in the 1986 "Uranium Industry Annual Survey." The methodology described herein was used to estimate year-of-delivery prices for contract-specified prices, and price floors for market price contracts. Prices were estimated for 4.0 million pounds of uranium deliveries for the years 1986 through 1992. These estimated prices were used in developing weighted averages for year-of-delivery prices. The adjusted price for contract-specified prices is given in Table 36 of the report, and the adjusted floor price for market price contracts is given in Table 37.

The price estimates are the result of a regression analysis, which relates the prices reported by respondents to other contract information reported for all contracts (e.g., date of signing, year of delivery, etc.). The estimated prices represent an aggregation of prices actually paid in 1986 and predicted future prices reported by the respondents.

The general estimating equation was as follows:

$$EP_i = b_0 \cdot (NUEX_i)^{b_1} \cdot \left[b_2(k)\right]^t \quad ,$$

where:

i = month and year in which contract was signed,
t = number of years from contract signing date to year of delivery,
EP_i = estimated year-of-delivery price for contracts signed on date i, to be delivered in t years,
$NUEX_i$ = published NUEXCO[6] exchange price for contracts signed on date i, and

b_0, b_1, and $b_2(k)$ are regression coefficients to be estimated, where $k = 1$ for contracts signed in any year except 1978 or 1985, $k = 2$ for 1978, and $k = 3$ for 1985.

---

[6] NUEXCO, Inc., publishes monthly information on uranium prices.

From this analysis, the following specific estimating equations were developed:

$$EP_i = 1.35 \cdot (NUEX_i^{0.9161}) \cdot (1.052^t) \quad ,$$

for all years except 1978 and 1985,

$$EP_i = 1.35 \cdot (NUEX_i^{0.9161}) \cdot (1.041^t) \quad ,$$

for 1978, and

$$EP_i = 1.35 \cdot (NUEX_i^{0.9161}) \cdot (1.127^t) \quad ,$$

for 1985.

In general, the model shown above is similar to a compound interest formula, where the value of the investment in future years is equal to the initial principal times the interest rate received, compounded over the number of years in question. This model, as an estimate of future year-of-delivery prices, uses the NUEXCO price at the time the contract was signed (this is an estimate of the base price) times an escalation rate (to be estimated as the b_2 coefficient) compounded from the contract signing date to the year of delivery. The coefficients b_0 and b_1 (estimated) were used to provide added flexibility in the model. If a coefficient is not significantly different from 1, the variable is eliminated from the model.

As shown above, a different coefficient for $b_2(k)$ was estimated for contracts signed in 1978 and 1985. This was done as a result of an analysis of the reported prices to determine whether the escalation *rate* (i.e., the b_2 coefficient) varied according to the date of the contract's signing. The analysis showed that the escalation rate for contracts signed in 1978 and 1985 was significantly different from the rates for contracts signed in other years.

As a measure of the accuracy of the estimating equation, the following statistics are presented. The R-squared statistic was equal to 0.81, meaning that 81 percent of the squared variation in the logarithm of the price data[7] can be explained by the four variables described above (i.e., time between contract signing and year of delivery, base price as measured by the NUEXCO price at the time of signing, and the dummy variables for the 1978 and 1985 contract signing years).

The regression coefficients b_0, b_1, and $b_2(k)$ were also tested to see whether there was a statistically significant difference from 1 in each case. This test helps to determine whether the variables associated with the coefficients should be included in the model. Table B1 shows the results of this analysis. All the coefficients were statistically significant at the 0.0001 level.

Table B1. Significance Tests for Regression Coefficients in the General Estimating Equation

Variable	Coefficient	Value From t Test	Significance Level[a]
Intercept	b_0	1.29	0.0001
NUEXCO Price	b_1	11.30	0.0001
Elapsed Years	b_2 $(k = 1)$	7.91	0.0001
1978 Contracts	b_2 $(k = 2)$	-7.39	0.0001
1985 Contracts	b_2 $(k = 3)$	8.11	0.0001

[a] Assuming that the variance estimates of the error term are accurate.

---

[7] The R-squared statistic applies to the logarithm of the price estimate. The logarithmic forms of the equations were used to estimate the coefficients.

In addition to the requirement for estimating missing uranium price data, as described above, there was a need to reconcile discrepancies in the prices reported by the buyer and seller in a contract (e.g., a respondent who is the purchasing party in a given contract may have reported an estimated delivery price different from that reported by the respondent who is the selling party in the same contract). The reason that price discrepancies occur between two respondents involved in the same uranium contract is that the two parties may make different assumptions concerning the price escalation indices specified in the contract. To reconcile such differences when they occurred, telephone calls were made to the respective respondents. If no reconciliation was reached, an average price was computed and used in developing the industry price statistics reported in this document.

Another issue related to price data is that prices for future years as shown in the publication may not be indicative of the industry average price that will be realized when actual deliveries are made because:

- Average prices for future years are affected by the ability of each respondent to predict what the price will be on a contract- by-contract basis.
- Average prices for future years are based on commitments in place at a particular point in time (January 1984, January 1985, etc.).

This problem is aggravated the further one goes into the future. Furthermore, because of changing market expectations, a definitive relationship between the prices at various points in time does not always exist.

Table B2 presents a comparison of data published by NUEXCO to data published by the Energy Information Administration (EIA) in this report. This comparison is undertaken as a way of verifying certain data collected in the surveys and to present to the reader the results of this verification. As can be seen in Table B2, the data published by NUEXCO are comparable to the EIA, with only modest differences.

Table B2. Comparison of Data Published by the Energy Information Administration and Nuexco Information Services on the Domestic Uranium Industry

Item	NUEXCO		EIA	
	1985	1986	1985	1986
Uranium Concentrate Production (Million pounds)	11.3	13.8	[a] 11.3	[a] 13.5
Surface drilling (exploration and development)	1.9	1.8	1.8	2.1
Exploration drilling as a percent of total	NA	70.0	80.0	53.0
Development drilling as a percent of total	NA	30.0	20.0	47.0
Yearly Average Spot purchace price of uranium concentrate	15.18	17.12	15.13	16.91

[a] Does not include uranium concentrate procuction from pilot *in situ* leach and production as a byproduct of rare earth elements.

NA, Not Available.

Note: The Nuexco yearly average spot purchase price is a quantity weighted average of the Nuexco monthly transaction values. The Energy Information Administration price is a quantity weighted average of contracts signed in the year indicated for delivery in the same year. The contracts included in this average are purchases by U.S. utilities from domestic suppliers.

Source: **NUEXCO, 1985-1986**–Nuexco Monthly Report on the Nuclear Market, Number 222 (Denver, Colorado, February 1987). **Energy Information Administration 1985**– Energy Information Administration, *Uranium Industry Annual* 1985, DOE/EIA-0478(85) (Washington, D.C. November 1986) **Energy Information Administration 1986**– Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey" (1986).

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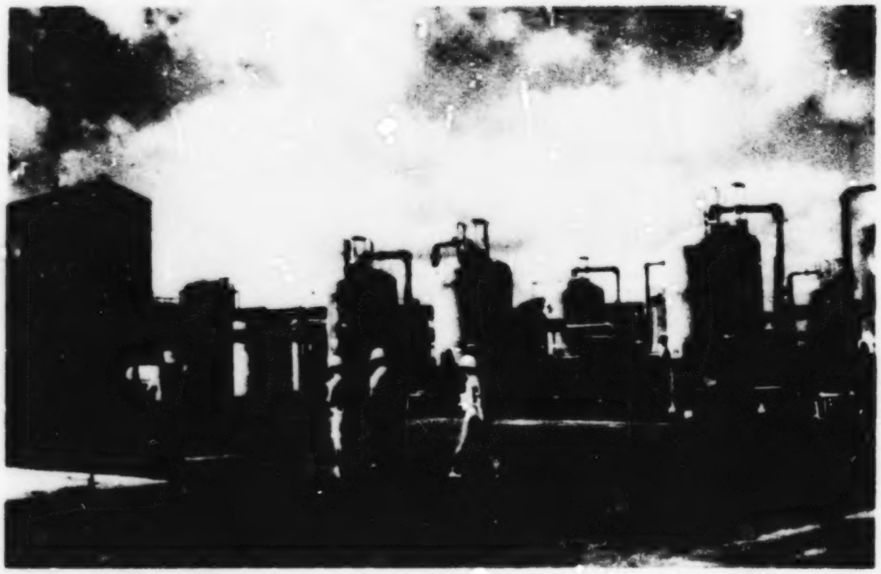
Appendix C

Respondents Providing Data to the Uranium Industry Annual Survey

Recovery facility for treating uranium-bearing solutions obtained from an in situ mining operation.



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Appendix C

Respondents Providing Data to the Uranium Industry Annual Survey

Adobe Resources Corp.
Advanced Nuclear Fuels Corp.
Agip Mining Co., Inc.
Alabama Power Co.
Allied Corp.
Amax Copper, Inc.
American Electric Power Service Corp.
American Nuclear Corp.
Anaconda Minerals Co.
Anaheim Public Utilities Dept.
Arizona Public Service Co.
Arkansas Power & Light Co.
Atlas Corp.
Babcock & Wilcox
Baltimore Gas & Electric
Ben Urralburu Co.
BGS Mining Corp.
Birco Development, Inc.
Bokum Resources Corp.
Boston Edison Co.
Brush Wellman, Inc.
Buttes Resources Co.
Caithness Corp.
Calvin Black Enterprises
CAPCO Companies
Carolina Power & Light
Cherokee Exploration/Groth Minerals
Chevron Resources Co.
Cleveland-Cliffs Iron Co.
Coastal Uranium, Inc.
Cobb Resources Corp.
Cogema, Inc.
Combustion Engineering, Inc.
Commonwealth Edison
Conoco, Inc.
Consolidated Edison Co. of New York, Inc.
Consumers Power Co.
Cotter Corp.
Cyprus Mines Co.
Dairyland Power Cooperative
Dawn Mining Co.
Dawson Mining Co.
Denison Mines (U.S.), Inc.
Detroit Edison
Dolores Bench Ltd. Partnership
Duke Power Co.
Energy Benefits Exploration
Energy Fuels Nuclear, Inc.
ENSERCH Exploration, Inc.
Everest Exploration Corp.
Ferret Exploration Co., Inc.
Florida Power & Light
Florida Power Corp.
Foster Co.
Four Corners Exploration Co.
Freeport Uranium Recovery Co.
Gardinier, Inc.
Garth Noyes
Gates & Fox Co., Inc.
Georgia Power Co.
Getty Mining Co.
Global Natural Resources Corp.
GPU Nuclear Corp.
Gulf States Utilities Co.
Hecla Mining Co.
Highland Uranium Project Joint Venture
Homestake Mining Co.
Houston Lighting & Power Co.
Illinois Power Co.
Imperial Metals Corp.
Intercontinental Energy Corp.
International Minerals & Chemicals
Iowa Electric Light & Power Co.
Kansas Gas & Electric Co.
Keradamex, Inc.
Kramer, Harold G.
Lander Energy Co.
Long Island Lighting Co.
Maine Yankee Atomic Power Co.
Malapai Resources Co.
Marline Uranium Corp.
Mesa Limited Partnership
Middle South System Services, Inc.
Minatome Corp.

Minerals Exploration Co.
Mining Unlimited, Inc.
Mobil Mining & Minerals Co.
Mono Power Co.
Moore Energy Corp.
ND Resources
Nebraska Public Power District
Newpark Resources, Inc.
New York Nuclear Corp.
New York Power Authority
Niagara Mohawk Power Corp.
Noranda Exploration, Inc.
Northeast Utilities Service Co.
Northern States Power Co.
Nose Rock, Inc.
NUEXCO
NUKEM, Inc.
Omaha Public Power District
Pacific Gas & Electric Co.
Pathfinder Mines Corp.
Pennsylvania Power & Light Co.
Philadelphia Electric Co.
Phillips Uranium Corp.
Placer U.S., Inc.
Portland General Electric Co.
Public Service Co. of Colorado
Public Service Electric & Gas
Public Service of Indiana
Public Service of New Hampshire
Quipu Corp.
R & B Mining Co.
Rajah Ventures, Ltd.
REB Mining Co.
Reserve Industries Corp.
Rio Algom Mining Corp.
Riverside Public Utility Dept.
Robert E. Miller Co.
Rochester Gas & Electric Corp.
Rocky Mountain Energy
Ryan, Ltd.
Sacramento Municipal Utility Dist.
San Diego Gas & Electric
Santa Fe Mining, Inc.
Sequoyah Fuels Corp.
Simons Associates
Sohio Western Mining
South Carolina Electric & Gas
Southern California Edison Co.
Taminco, Inc.
Tenneco Minerals Co.
Tennessee Valley Authority
Texaco, Inc.
Texas Eastern Nuclear
Texas Utilities Generating Co.
Todilto Exploration & Development Corp.
UG U.S.A., Inc.
Umetco Minerals Co.
UNC Teton Exploration Drilling
Union Electric Co.
Union Oil Co. of California
United Nuclear Corp.
Uranerz USA, Inc.
Uranium Extraction Florida, Inc.
USX Corp.
Utah Power & Light Co.
Vermont Yankee Nuclear Power Corp.
Virginia Power Co.
Washington Public Power Supply
Western Nuclear, Inc.
Westinghouse Electric Corp.
Wisconsin Electric Power Co.
Wisconsin Public Service Corp.
Wold Nuclear Co.
Wolf Creek Nuclear Operating Corp.
Wyoming Dept. of Environmental Quality
Wyoming Fuel Co.
Yankee Atomic Electric Co.

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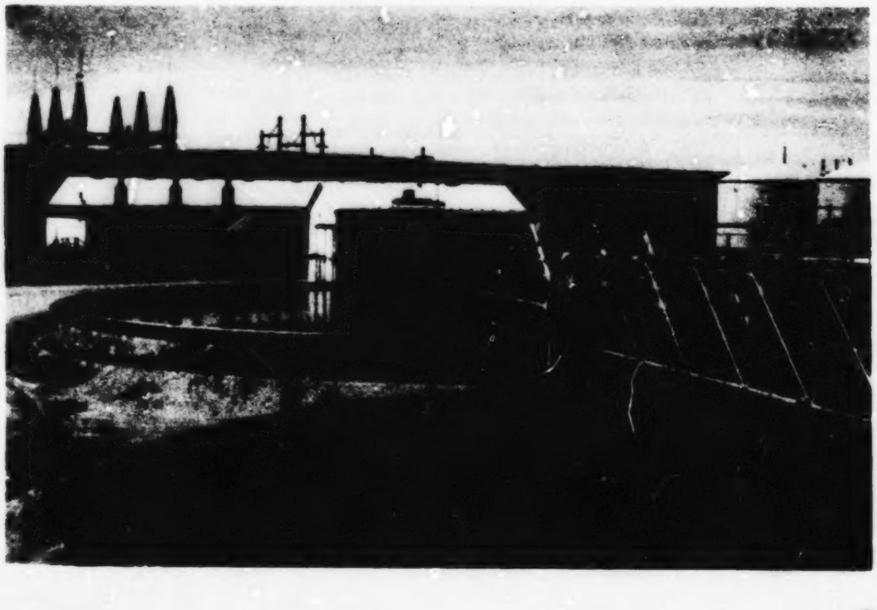
Appendix D

Form EIA-858: Uranium Industry Annual Survey



Settling tanks for the separation of liquid and solid phases during milling of uranium ore at a conventional mill.

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Appendix D
Form EIA-858: Uranium Industry Annual Survey

Form Approved
OMB No. 1905-0160
(Expires 12/31/87)

U. S. DEPARTMENT OF ENERGY
ENERGY INFORMATION ADMINISTRATION
URANIUM INDUSTRY ANNUAL SURVEY

Data on this mandatory survey are collected under authority of Section 170B of the Atomic Energy Act of 1954, as amended (42 U.S.C. 790a) and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b). Late filing, failure to keep records, or failure otherwise to comply with these instructions may result in criminal fines, civil penalties, and other sanctions as provided by law. Provisions concerning confidentiality of the data collected are explained in the instructions.

Telephone Number ( ) ____________

Name of Firm: ____________

Street Address: ____________ Zip: ____________

City: ____________ State: ____________

The Uranium Industry Annual Survey, Form EIA-858, consists of the following Schedules:

Schedule A: Uranium Raw Materials Activities, (Schedule A contains Parts I, II, III, IV, V, VI, and VII)
Schedule B: Uranium Marketing Activities
Schedule C: Uranium Industry Financial Status

Uranium Industry Annual Survey — General Instructions:

Schedules A and B are included in this package. Schedule C will follow in late February. Schedules A and B may be separated and completed by different officials in your firm. If Schedules A and B are separated, please photocopy the instructions given on this and the following page and attach these instructions to each Schedule. The person responsible for each Schedule must be indicated on the first page of the Schedule.

Read the following General Instructions A through I; If NONE of the Schedules A, B, or C apply to your firm, check the "NOT APPLICABLE" box, complete the certification statement on page 2, and return the entire survey form to the EIA.

A. **Purpose:** The Uranium Industry Annual Survey, Form EIA-858, is designed to collect data on uranium raw materials activities, marketing activities, and finances for the preceding calendar year. Data on projections for future years are also collected for some activities.

B. **Criteria for responding to the Uranium Industry Annual Survey:** The criteria listed below apply to the entire Form EIA-858 survey document. The criteria that apply to Schedules A, B, and C are restated at the beginning of each Schedule.

Who Must Respond:

1. Firms that are controllers[1], were controllers during any portion of 1986, or are identified in EIA records as the most recent controllers of properties[2], mines, mills, or plants identified on pages 7, 11, 13, 15, or 18.
2. Firms involved as controllers[1] of uranium exploration and development ventures in the United States; firms involved as controllers of solution mining drilling in the United States; U.S. firms that conduct activities in foreign countries for uranium exploration and development that are funded by U.S. operations.
3. Firms that incurred uranium exploration expenditures in 1986 or plan such expenditures in 1987.
4. Firms that hold economic[2] or subeconomic uranium reserves[2] in specific properties by right of title, contract, lease, or concession and that are directly responsible for the development and exploitation of the reserves in those properties.
5. Firms that control uranium mining properties, including firms that are controllers[1] of mines under joint-ownership agreements or by contract agreements; firms that control in situ uranium recovery facilities.
6. Firms that control[1] commercial uranium extraction from ore, leach solutions, or as a byproduct of the processing of a different commodity.
7. Firms that purchase, sell, or own domestic- or foreign-origin uranium.

---

[1] Definition: Controllers are firms or individuals that, by virtue of title, contract, lease, or concession, own properties with uranium reserves or are responsible for the exploration and development of uranium reserves and the extraction of uranium as a primary product or byproduct; own or are responsible for the operation of uranium mines, mills, or processing plants; or are the operators of uranium industry joint ventures.

[2] See definition on page 6.

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U. S. Department of Energy
Energy Information Administration
Uranium Industry Annual Survey

General Instructions (continued)

C. Each firm receiving the Uranium Industry Annual Survey and meeting any of the criteria listed above under General Instruction B must respond to each of the three Schedules. The certification statement must be completed for each Schedule whether or not the Schedule is applicable to your firm. For each Schedule that does not apply, please check the "NOT APPLICABLE" box on the first page of the Schedule.

D. If a Part of a Schedule does not apply to your firm, check the "NOT APPLICABLE" box provided at the beginning of that Part. If a particular Item within a Part does not apply, indicate this by entering "NA" for that Item. If the answer to a question is a zero, enter a "0" or the word "none" in the space provided rather than the symbol "NA".

E. The data reported for your firm on the Uranium Industry Annual Survey form should be current to December 31, 1986.

F. The entire Form EIA-858 should be returned in the business-reply envelope provided with the form to:

Energy Information Administration, EI-53
Mail Station Forrestal BG-094
U. S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

G. Schedules A and B of Form EIA-858 must be submitted together by March 7, 1987. Schedule C, which will be mailed to you in February 1987, must be submitted by April 1, 1987. All Schedules received by your firm must be returned to the EIA whether or not they are applicable to your firm.

H. If more space is needed to report information for any item, use the Additional Comments section provided at the end of each Part. Additional pages may be appended as necessary. Please identify comments by item numbers.

I. Provisions regarding the confidentiality of information: The EIA has determined that the data to be furnished on individual company uranium exploration, development, reserves, production, operations, uranium industry financial information, and marketing activities may constitute confidential commercial information as specified in the Freedom of Information Act (5 U.S.C. 552). The EIA has taken the position that such individual company data will be kept confidential to the maximum extent permitted by the Freedom of Information Act (5 U.S.C. 552) and the Trade Secrets Act (18 U.S.C. 1905).

The Uranium Industry Annual Survey, Form EIA-858, does not apply to my firm, because none of the criteria shown above are applicable.

☐ NOT APPLICABLE

Certification Statement - I certify that the historical and estimated information provided herein and appended hereto are true and accurate to the best of my knowledge, information and belief. Title 18 U.S.C. 1001 makes it a criminal offense for any person knowingly and willingly to make to any Agency or Department of the United States any false or fraudulent statements as to any matter within its jurisdiction.

Signature of Certifying Official: ______________________________

Name of Certifying Official (Please Print): Mr. Mrs. Ms. ______________________________

Title: ______________________________

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Energy Information Administration
Uranium Industry Annual Survey
Schedule A

Schedule A: Uranium Raw Materials - General Instructions

Criteria for Schedule A, Parts I, II, III, IV, V, VI, and VII concerning Who Must Respond:

1. **Firms that are controllers[1], were controllers during any portion of 1986, or are identified in EIA records as the most recent controllers of properties[2], mines, mills, or plants identified on pages 7, 11, 13, 15 or 18. Complete Parts I, II, III, IV, V, VI and VII as appropriate.**

2. **Firms involved as controllers[1] of uranium exploration and development ventures in the United States; firms involved as controllers of solution mining drilling in the United States; U. S. firms that conduct activities in foreign countries for uranium exploration and development that are funded by U. S. operations. Complete Parts I and VII.**

3. **Firms that incurred uranium exploration expenditures in 1986 or plan such expenditures in 1987. Complete Parts I and VII.**

4. **Firms that hold economic[2] or subeconomic uranium reserves[2] in specific properties by right of title, contract, lease, or concession and that are directly responsible for the development and exploitation of the reserves in those properties. Complete Parts II, III, IV, V, VI, and VII.**

5. **Firms that control uranium mining properties including firms that are controllers[1] of mines under joint-ownership agreements or by contract agreements; firms that control in situ uranium recovery facilities. Complete Parts II, III, IV, V, VI, and VII.**

6. **Firms that control[1] commercial uranium extraction from ore, leach solutions, or as a byproduct of the processing of a different commodity. Complete Parts V, VI, and VII.**

[1] Definition: Controllers are firms or individuals that, by virtue of title, contract, lease, or concession, own properties with uranium reserves or are responsible for the exploration and development of uranium reserves and the extraction of uranium as a primary product or byproduct; own or are responsible for the operation of uranium mines, mills, or processing plants; or are the operators of uranium industry joint ventures.

[2] See definition on page 6.

If no part of Schedule A is applicable to your firm, please check the box at the right and complete the certification below.

☐ **NOT APPLICABLE**

Certification Statement - I certify that the historical and estimated information provided herein and appended hereto are true and accurate to the best of my knowledge, information and belief. Title 18 U.S.C. 1001 makes it a criminal offense for any person knowingly and willingly to make to any agency or department of the United States any false or fraudulent statements as to any matter within its jurisdiction.

Certifying Signature for Schedule A: ______________________ Date: ____________

Name of Certifying Official (Please Print): Mr., Mrs., Ms. ______________________

Title: ____________

Name of Contact Person for Schedule A: ______________________

Company Name: ______________________ Phone: ( ) ____________

Street Address: ______________________

City: ____________ State: ____________ Zip: ____________

Parent Company: ______________________

Please complete the above section if the address for the contact person is different from that shown on page 1. Mail Schedule A (whether or not it is applicable to your firm) with Schedule B to the following address:

Energy Information Administration, EI-53
Mail Station Forrestal BG-094
U. S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

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Company I.D. ☐☐☐☐☐☐☐☐☐☐

Energy Information Administration
Uranium Industry Annual Survey
Schedule A

Schedule A: Part I: Exploration

Who Must Respond: Refer to the criteria for Part I listed on Page 3 at the beginning of Schedule A.

If Schedule A, Part I is not applicable to your firm, please check the box at right. If Part I is applicable, continue with Item 1 below. ☐ NOT APPLICABLE

Item 1: Joint Venture Arrangements:

In reporting data for a joint-venture arrangement in Schedule A, the controlling partner in a joint venture is to report on the full scope of activities conducted under the venture agreement. The other participants in the joint venture SHOULD NOT REPORT data for the same activities. The objective is to prevent duplicate reporting of information on joint-venture activities.

1 Is your Company the Controlling Partner in a Joint Venture or Joint Ventures? A. ☐ Yes. B. ☐ No.

If "yes" list name(s) of Joint Venture Partner(s)

1. ____________________ 2. ____________________

3. ____________________ 4. ____________________

Item 2: Land Acquired for Exploration and Cost:

Report in 2A the acreage acquired for uranium exploration purposes. Examples of acreage that should be reported include: fee, mineral fee, leases, patented and unpatented mining claims, options to purchase mineral fee, etc. Report in 2B the cost of all such acquisitions and rentals. Exclude acreage held for the purpose of production of uranium from known commercial deposits. Exclude land held in foreign countries.

2 A Acreage Acquired during 1986: ____________________ Acres **2 B Cost of Acreage Acquired during 1986: $** ____________________

2 C Acreage held on December 31, 1986: ____________________ Acres

Item 3: Exploration and Development Surface Drilling and Solution Mining Drilling by State, and Total Expenditures in the United States during 1985: (Do not include drilling done in foreign countries.)

Column 3 A Definition: **Exploration drilling** is drilling done in search of new mineral deposits, on extensions of known ore deposits, or at the location of a discovery up to the time when the company decides that sufficient ore reserves are present to justify commercial development. Assessment drilling activities should be reported as exploration drilling activities.

Column 3 B Definition: **Development drilling** includes all drilling done in an ore deposit to determine more precisely size, grade, and configuration subsequent to the time the determination is made that the deposit can be commercially developed. Not considered as development drilling are secondary development drilling, solution-mining drilling for production, production-related underground drilling, and open-pit drilling done for the control of mining operations.

Column 3 C Definition: **Solution-mining drilling** is drilling done exclusively for solution-mining production. Solution-mining drilling also is all drilling done subsequent to the initial development drilling which has defined the size, grade and configuration of a solution-mining deposit. Solution-mining drilling includes pattern-development and monitor wells.

State	3 A - Exploration		3 B - Development		3 C - Solution Mining	
	Holes	Feet	Holes	Feet	Holes	Feet
Arizona						
Colorado						
Nebraska						
New Mexico						
Texas						
Utah						
Wyoming						
Others (please specify)						
Totals						

Items 3 D through 3 F: Enter the total cost for exploration drilling, development drilling, and solution-mining drilling.

Total U.S. Drilling Expenditures Incurred in 1986	3 D - Exploration	3 E - Development	3 F - Solution Mining
	$	$	$

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Schedule A: Part I: Exploration (continued)

Item 4: All Other Exploration Expenditures:

Report expenditures for all other exploration directly associated with the company's domestic uranium exploration effort. Exclude land acquisitions and drilling programs already covered in Items 2 and 3, solution-mining drilling, and work in foreign countries. Included would be items such as geochemical and geophysical uranium investigations and costs incurred by field personnel in the course of exploration efforts; expenditures for geological research; and overhead and administrative charges directly associated with supervising and supporting field and exploration activities. The overhead and administrative charges reported should not include internal corporation charges, such as directors' salaries, that are not directly associated with the company's exploration effort.

4 All Other Exploration Expenditures during 1986 were $ ____________

Item 5: 1986 and 1987 Foreign Contributions to Exploration Expenditures

Report the percentages for 1986 and 1987 of your company's total U. S. exploration expenditures, shown in Items 2, 3, and 4 above, contributed by foreign-controlled companies. By foreign-controlled we mean majority-owned by non-U.S. entities.

5 A The percentage of my company's 1986 total U.S. exploration expenditures contributed by a foreign-controlled company or companies was ________ percent.

5 B The percentage of my company's 1987 total U.S. projected exploration expenditures planned to be contributed by a foreign-controlled company or companies will be ________ percent.

Item 6: Projected 1987 Surface and Solution-Mining Drilling:

Column A and B: Refer to the definitions for exploration and development drilling under Item 3 A and Item 3 B above.
Column C: Enter the combined estimate of cost of land, exploration and development drilling, and all additional exploration expenditures. Refer to the instructions for Items 2, 3, and 4. Do not include expenditures for solution mining.
Column D: Refer to the definition of solution mining under Item 3 C above.
Column E: Enter total expenditures for solution mining.

6 Projected Estimates for 1987 of Total Surface Drilling and Solution-Mining Drilling and Costs. Do not include work in foreign countries.

Year	6 A Exploration		6 B Development		6 C Total Expenditures for Surface Drilling and All Other Expl. Activ.	6 D Solution Mining		6 E Total Expenditures for Solution Mining
	Holes	Total Footage	Holes	Total Footage		Holes	Total Footage	
1987 (est)					$			$

Item 7: Total Expenditures for Uranium Exploration in Foreign Countries: In columns 7A through 7D, enter the name of the foreign country or countries and the total exploration expenditures made there by your firm during 1986 and the amount planned for 1987.

Year	7 A Name of Country	7 B Name of Country	7 C Name of Country	7 D Name of Country
1986	$	$	$	$
1987 (est)	$	$	$	$

Item 8: Additional Comments - Schedule A, Part I:

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Uranium Industry Annual Survey
Schedule A

Explanatory notes for Parts II through VI:

On Schedule A, information for 1986 relating to (1) uranium properties and economic and subeconomic reserves on those properties, (2) conventional mine status and related mine production of uranium, (3) nonconventional mine status and related mine production of uranium, (4) conventional uranium concentrate production, and (5) nonconventional uranium concentrate production are requested separately in Parts II, III, IV, V, and VI respectively. This arrangement responds to an industry request to have the survey form provide for separate reporting of data for technologically different mining and processing operations.

To assist repondents in completing the Uranium Industry Annual Survey, Form EIA-858 for 1986, selected information on reserves properties, uranium mines, and mills and plants that your company supplied to EIA on the 1985 form is preprinted in Parts II through VI in Schedule A. In your response for 1986, please update or change these preprinted data as appropriate to report the correct data as of December 31, 1986.

The EIA also is requesting data for additional uranium properties, mines, and mills and plants — other than those preprinted — that were controlled by your company in 1986, and one complete set of blank pages is included for that purpose. To report data for more that one additional property, mine, or mill and plant, photocopy pages 7 through 14 as needed: specific instructions are provided under each part of Schedule A where applicable.

DEFINITIONS

Uranium Property - A specific piece of land with uranium reserves, which may be developed or undeveloped, which is held for the ultimate purpose of economically recovering the uranium.

Uranium reserves consist of economic ore reserves and subeconomic reserves as defined below.

Economic Ore Reserves - Those ore reserves that occur in known mineral deposits located in the United States of such size, grade and configuration that they reasonably could be expected to be recoverable at or below specified production costs with currently proven mining and processing technology and under current law and regulations. Estimates of the quantities of uranium, ore grades, and deposit configurations are based on specific sample data and measurements of the deposits and knowledge of deposit characteristics. Production costs mean future costs that would have to be incurred to produce the uranium in the form of U_3O_8 concentrate. Economic reserves generally are those reserves with the highest probability or occurrence (known variously as discovered reserves, proven reserves, or ore reserves) that are recoverable at a profit and the profit is based on current contracts or on current market conditions.

Subeconomic Reserves - Those uranium resources/reserves that conform to the above definition of economic reserves with the exception that their specified production costs exceed the costs currently considered economic and render unprofitable the exploitation of these reserves. The resources/reserves: (1) could have been defined some time prior to the current year, (2) were determined initially to be subeconomic, or (3) were determined initially to be economic and have since become subeconomic in light of current market conditions.

Schedule A: Part II: Economic and Subeconomic Uranium Reserves.

Who must respond: Refer to the criteria for Part II listed on Page 3 at the beginning of Schedule A.

If Schedule A, Part II is Not Applicable to the activities of your firm please check the box at right. If Part II is applicable, continue with the next item below.

☐ NOT APPLICABLE

(Schedule A, Part II is continued on Page 7)

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Schedule A: Part II: (continued)

Item 9: Economic and Subeconomic Uranium Reserves

Data on each property with economic and subeconomic uranium reserves controlled by your company are requested under Item 9 below. For each property, economic reserves data are requested in Items 9 A through 9 F, and subeconomic reserves data are requested in Item 9 G. Each property should be reported separately on a set of pages 7 through 10. Refer to the definitions for Controller on page 3 and the definitions for Uranium Reserves and Uranium Property on page 6.

The name of each property with reserves indicated in our records as being controlled by your company is preprinted on page 7. The name of each property is preprinted in items 9 A 1 and 9 B 1. Other pertinent information is also preprinted. Please review all preprinted information, and update, change, or correct it as necessary to report 1986 information for each property and reserve.

If your company controlled reserves properties in 1986 that are not named in preprinted information, please also complete a set of pages 7 through 10 for each such property. Photocopy the set of "blank" pages 7 through 10 as necessary to report the requested data for each reserves property, and append the additional completed sets of pages at the end of Part II.

Item 9 A: Uranium Reserve Properties

1 Property Name ______________________________

2 Are the uranium deposits mined out?	Yes ☐	No ☐
3 Has the property been dropped?	Yes ☐	No ☐
4 Are you the controller of the property named in 9 A 1?	Yes ☐	No ☐

5 If your answer to 9 A 3 is yes, or 9 A 4 is no, indicate to whom the property has been contracted, leased, or otherwise conveyed.

Sold ☐ Leased ☐ Other ☐ Please specify ______________________________

6 If you are no longer the owner or controller of this property, please give the name of the company which is the present controller or to whom the title of this property was transferred. If control of this property has reverted to a State or Federal agency, please provide the name of the agency.

Company Name: ______________________________

Street Address: ______________________________

City: ____________________ State: __________ Zip: ____________________

7 What is the nature of the arrangement with the company described in Item 9 A 6?

a Title Transfer ☐

b Contract ☐

c Lease ☐

d Other Arrangement ☐ (please specify) ____________________

8 If the property named in 9 A 1 has been aggregated or consolidated with another property or properties to form a new property, please list below the names of the original properties involved in the consolidation or aggregration:

____

9 If the property named in 9 A 1 has been aggregated or consolidated with another property or properties to form a new property, please list below the name of the new property.

____

Items 9 B through 9 G below refer to the property identified in Item 9 A 1 on this page. If this property is no longer controlled by your company, please skip 9 B through 9 G for this property. Continue with the next property or mine. Complete additional pages 7 through 14 for properties controlled by your company and not named in preprinted information.

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Schedule A: Part II: (continued)

Item 9: Economic and Subeconomic Uranium Reserves (continued)

Item 9 B: Property Description

1 Property Name: ______________________ **2 Other Name(s), if any:** ______________________
(Other commonly used name of the property)

3 Location: Enter the following location information as appropriate: Enter the latitude and longitude to the nearest degree and minute that approximate the geographic center of the property:

a State: ______________________ **b County:** ______________________

c

Section(s)	**Township(s) N. or S.**	**Range(s) E. or W.**	**Latitude N.**	**Longitude W.**
			N.	W.

d Principal Meridian: ______________________

e Land Abstract Number: ______________________

Item 9 C: Ownership - List All Firms Having Joint or Partial Ownership of this Property and their Percentage of Ownership.

Name of Firm:	**Percentage of Ownership:**
1 ______________________	______________________ %
2 ______________________	______________________ %
3 ______________________	______________________ %
4 ______________________	______________________ %

Item 9 D: Economic Ore Reserves - Refer to the definition of economic reserves provided on page 6.

Reported Economic Reserves as of December 31, 1985 (if reported to EIA):	______________	**Thousand Tons of Ore**
	______________	**Thousand Pounds of U_3O_8**

In the following table, enter the quantity of economic ore reserves on this property by the method of mining used to estimate the reserves. If more than one mining method is applicable, enter the quantity for each method as a mutually exclusive component of the total reserve on this property. Please report quantities of ore to the nearest thousand tons of ore and uranium to the nearest thousand pounds of U_3O_8. Report the quantity of contained U_3O_8 for byproduct reserves. Report either the equivalent tons of in-place ore or the average grade in percent U_3O_8 for in situ reserves. If the "other" column is used, please report the method of mining in the space provided.

Economic Ore Reserves as of December 31, 1986

9D1	**Open Pit**	**Underground**	**In Situ**		**Byproduct**		**Other** [2]	
	▨	▨	**Report Tons or Grade**		**Phosphate**	**Copper**	**Report Tons or Grade**	
Ore	1000 Tons	1000 Tons	1000 Tons	Percent	▨	▨	1000 Tons	Percent
U_3O_8	1000 Lbs	1000 Lbs	1000 Lbs		1000 Lbs	1000 Lbs	1000 Lbs	

[2] **Other, please specify:** ______________

2 Date the above assessment of economic reserves was made (Month/Year) ______________________

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Schedule A: Part II: (continued)

Item 9: Economic and Subeconomic Uranium Reserves (continued)

Item 9 D: Economic Reserves (continued)

3 Please check the criteria used for the most recent assessment of Economic Reserves. Include all items appropriate to this property such as current market price or current contract price.

a Current Market (Spot) Price ☐

b Current Long Term Contract Price ☐

c Other (Please specify) ☐ **Other:** ____________________

Item 9 E 1: Operating Costs Used to Estimate Ore Reserves in 9 D 1 above. Please show actual unrounded values.

a direct mining costs: $____________ **/Ton of Ore** (direct operating cost of mining the ore including the costs for supervision, engineering, labor, fuel, supplies, production taxes, equipment replacement, maintenance, environmental work, etc.)

b Haulage costs: $____________ **/Ton of Ore** (the cost of loading and transporting ore from the mine site to the mill)

c Royalty costs: $____________ **/Ton of Ore** (royalties to lessors and/or overriding royalties to previous owners)

d Direct milling costs: $____________ **/Ton of Ore** (direct operating cost of milling including the costs for supervision, engineering, labor, supplies, reagents, and maintenance in connection with actual processing of ore)

e Indirect costs: $____________ **/Ton of Ore** (indirect costs including fixed overhead costs, insurance, guard force, utilities, certain office personnel, property taxes, and other administrative costs)

f Other costs: $____________ **/Ton of Ore** (other applicable costs that are considered in deriving the break-even cut off grade, Item 9 F 7, but are not included in Items 9 E 1 a through Item 9 E 1 e)

g Describe the Other cost items: ____________________

Item 9 E 2: Capital Costs - Capital costs used to estimate ore reserves in 9 D 1 above. "Present costs" means disbursed costs minus accumulated depreciation and amortization to date. "Future costs" means anticipated future capital costs, in constant dollars, that must be expended to bring this property into production.

	Present Costs (Thousand Dollars)	Future Costs (Thousand Dollars)
a Acquisition - Including cost of land acquisition, stock purchase, costs of concession or lease, etc.	$ ____________	$ ____________
b Mining - Capitalized costs including exploration and development drilling, pre-mine stripping, shaft sinking, mine plant and equipment, etc.	$ ____________	$ ____________
c Milling - Capitalized costs including construction costs of mill, plant or facility, costs of processing equipment, etc.	$ ____________	$ ____________
d Reclamation and Decommissioning - Capitalized costs including reclamation and decommissioning expenses for the mine, dumps, mill tailings, mill, plant, facility and equipment, etc.	$ ____________	$ ____________

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Schedule A: Part II: (continued)

Item 9: Economic and Subeconomic Uranium Reserves (continued)

Item 9 F: **Bore Hole and Reserve Parameters for Economic Ore Reserves. For conventional mine sites and nonconventional sites where break-even cutoff grade is known, please report the break-even cutoff grade (7a below). If the break-even cutoff is not applicable, please report the grade-thickness product (7b below).**

1 Number of holes drilled within reserve outline during 1986: . . . . ____________ Holes

2 Number of holes drilled within reserve outline prior to 1986: . . . . . . ____________ Holes

3 Average depth of ore in feet below natural ground surface: . . . . ____________ Feet

4 Average thickness of ore deposit:. . . . . ____________ Feet

5 Average area of influence per hole used to estimate reserve: . . . . ____________ Square Feet

6 Average tonnage factor used to estimate reserve: . . . . ____________ Cubic Feet/Ton

7 a Break-even cutoff grade[3] used to estimate the above reserve (9 D 1): . ____________ Percent U_3O_8

b Grade-Thickness Product used to estimate above reserve (9 D 1): . . . ____________ GT

8 Mill recovery factor used to estimate the above reserve (9 D 1): . . . . . ____________ Percent

9 Minimum mining height:. . . . . ____________ Feet

[3] Break-Even Cutoff Grade: The lowest grade of material that can be mined and processed considering all applicable costs, without incurring a loss or gaining a profit.

Item 9 G: **Subeconomic Reserves** - Refer to the definition of subeconomic reserves provided on page 6.

In the following table, enter the quantity of subeconomic reserves on this property by the method of mining used to estimate the reserves. If more than one mining method is applicable, enter the appropriate quantity for each method as a mutually exclusive component of the total reserve on this property. Please report quantities of ore to the nearest thousand tons of ore and uranium to the nearest thousand pounds of U_3O_8. Report the quantity of contained U_3O_8 for byproduct reserves. Report either the equivalent in-place tons or the average grade in percent U_3O_8 for in situ reserves. If the "other" column is used, please report the method of mining in the space provided.

Subeconomic Reserves as of December 31, 1986

9G 1	Open Pit	Underground	In Situ		Byproduct		Other[4]	
			Report Tons or Grade		Phosphate	Copper	Report Tons or Grade	
Ore	1000 Tons	1000 Tons	1000 Tons	Percent			1000 Tons	Percent
U_3O_8	1000 Lbs	1000 Lbs	1000 Lbs		1000 Lbs	1000 Lbs	1000 Lbs	

[4] Other, please specify: ______________________________

2 Average cost per pound U_3O_8 in subeconomic reserves: ________ \$/lb U_3O_8 (Include in your estimate all elements of Operating and Capital costs as defined in 9E 1 and 9E 2 in Part II of Schedule A)

3 Date the above assessment of subeconomic reserves was made (Month/Year) ____________________

Item 10 H: Additional Comments - Schedule A, Part II

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Schedule A

Who Must Respond: Refer to the criteria for Part III

If Schedule A, Part III is Not Applicable to the activities of your firm please check the box at the right. If Part III is applicable, continue with the next Item below.

☐ NOT APPLICABLE

Item 10: Data on conventional mines and related mine production of uranium in ore and solutions controlled by your company during 1986 are requested under Item 10 below. Refer to the definition of Controller on page 3.

Pages 11 and 12 may be preprinted with information on conventional mines reported by your firm and other sources. Please review all preprinted information, and update, change, or correct it as necessary to report 1986 information for each mine and its uranium production.

Please also report data for additional conventional mines, but for which no pages with preprinted information are supplied. Report data on location and status for each closed mine. Please photocopy pages 11 and 12 as necessary to report separately on each additional mine, and append the new pages at the end of Part III. One set of "blank" pages 11 and 12 is provided.

Item 10 A. Mine Description

1. Mine Name: ____________________ 2. Other Name(s), if any: ____________________

3. Name of reserve property on which this mine is located: ____________________

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Reserve Property I.D. ☐☐☐☐☐☐☐☐☐

4. Permit / Identification Information

a. State Mining / Milling Permit Number: ____________________

b. Mine Safety and Health Administration (MSHA) Identification Number: ____________

and MSHA Name: ____________________

5. Status: a. Total number of hours mine was operated to produce uranium ore, heap leach or other solutions, or low-grade uranium-bearing material in 1986: ____________ hours

b. Estimated mine life based on existing reserves, current and planned production, and envisaged contracts: ____________ years

c. Nominal mine capacity: ____________ tons of ore per day; ____________ pounds of U_3O_8 per year

d. Was the mine operating throughout 1986? (Operated normally except for planned holiday/vacation periods and routine maintenance)
☐ Yes ☐ No

e. If answer to 5 d above is "No", give month and year of closing: ____________ Month ____________ Year

f. Mine is closed:
☐ Temporarily (planned to be reopened during 1986)
☐ Indefinitely (not planned to be reopened during 1986)
☐ Permanently (will not be reopened.)
☐ Reclaimed (reclamation in progress or completed)

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Mine I.D. ☐☐☐☐☐☐☐☐☐☐

Schedule A: Part III (continued)

Item 10 Conventional Mine Status and Mine Production of Uranium (continued)

Item 10 A 5 Status (continued)

g. If mine is closed, give estimated holding (standby) cost: $ ______________ Per Year
h. If mine is closed, give the estimated cost of reopening: $ ______________
i. If a decision were made today to reopen this mine for uranium production, how many months would be required to bring it into full, sustained production? ______________ Months

Item 10 B Production of Uranium from Conventional Mines in 1986:

In the following table, enter the quantity of material mined or recovered from the mine named in 10 A 1 above by the method of mining/recovery. If more than one method is applicable, enter the appropriate quantity for each method. Please report ore quantities to the nearest ton of ore, and pounds of uranium and vanadium to the nearest pound of oxide. If the "other" column is used, please report the method of mining in the space provided.

10 B: Mine Production in 1986:

	Open Pit	Underground	Other[5]	
Ore	Tons	Tons	Tons	Percent
U_3O_8	Lbs	Lbs	Lbs	
V_2O_5	Lbs	Lbs	Lbs	

[5] Other, please specify: ______________

10 C Shipments of ore or solutions in 1986:

1 To stockpile at mine site: Ore ______________ Tons; U_3O_8 ______________ Pounds; V_2O_5 ______________ Pounds

2 To Conventional mill(s): Ore ______________ Tons; U_3O_8 ______________ Pounds; V_2O_5 ______________ Pounds
Mill Name(s) ______________ Mill Location ______________

3 To buying station or other stockpile: Ore ______________ Tons; U_3O_8 ______________ Pounds; V_2O_5 ______________ Pounds
Buying Station Name(s) ______________ Buying Station Location ______________
Stockpile Name(s) ______________ Stockpile Location ______________

Item 10 D: Additional Comments: Schedule A, Part III:

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Company I.D.	☐☐☐☐☐☐☐☐☐☐
Field I.D.	☐☐☐☐☐☐☐☐☐☐

Who Must Respond: Refer to the criteria for Part IV listed on [illegible]

If Schedule A, Part IV is Not Applicable to the activities of your firm please check the box at the right. If Part IV is applicable, continue with the next Item below. ☐ NOT APPLICABLE

Item 11: Data on nonconventional mines (in situ leach fields and byproduct mining sites) and related mine production controlled by your company during 1986 are requested under Item 11 below. Refer to the definition of Controller on page 3.

Pages 13 and 14 may be preprinted with information on nonconventional mines reported by your firm and other sources. Please review all preprinted information, and update, change, or correct it as necessary to report information for 1986 for each mine and its uranium production.

Please also report data for additional nonconventional mines, but for which no pages with preprinted information are supplied. Report data on location and status for each closed nonconventional mine. Please photocopy pages 13 and 14 as necessary to report separately on each mine, and append the new pages at the end of Part IV. One set of "blank" pages 13 and 14 is provided.

Item 11 A. Field or Site Description

1 Field or Site Name: ______________________ 2 Other Name(s), if any: ______________________

3 Name of reserve property on which this field or site is located: ______________________

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Reserve Property I.D.	☐☐☐☐☐☐☐☐☐☐

4. Permit / Identification Information

a. State Mining / Milling Permit Number: ______________________

b. Mine Safety and Health Administration (MSHA) Identification Number: ______________

and MSHA Name: ______________________

5 Status: a Total number of hours mine or site was operated to produce uranium-bearing materials in 1986: ____________ hours

b Estimated field or site life based on existing reserves, current production, and envisaged contracts: ____________ years

c Nominal field or site capacity: ______________________ pounds of U_3O_8 per year

d Was the field operating throughout 1986? ☐ Yes ☐ No

e If answer to 5 d above is "No", give month and year of closing: ____________ Month ____________ Year

f Field or site is closed:

☐ Temporarily (planned to be reopened during 1987)

☐ Indefinitely (not planned to be reopened during 1987)

☐ Permanently (will Not be reopened)

☐ Reclaimed (reclamation in progress or completed)

g If field or site is closed, give estimated holding (standby) cost: $ ____________ Per Year

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Field I.D. ☐☐☐☐☐☐☐☐☐☐

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Schedule A: Part IV (continued)

Item 11 - Nonconventional Mine Status and Nonconventional Mine Production of Uranium (continued)

Item A 5 Status (continued)

h If field or site is closed, give estimated cost of reopening: $ ______________

i If a decision were made today to reopen this field or site for uranium production, how many months would be required to bring it into full, sustained production? ______________ Months

B Production of Uranium from Nonconventional Mines in 1986:

In the following table, enter the quantity of uranium recovered from the field or site named in 11 A 1 above by the recovery type. If more than one method is applicable, enter the appropriate quantity for each method. Please report uranium to the nearest pound of oxide. If the "other" column is used, please report the method in the space provided.

11 B: Nonconventional Production of Uranium in 1986:

	In Situ	Phosphate Byproduct	Copper Byproduct	Other[6]
U_3O_8	Lbs	Lbs	Lbs	Lbs

[6] Other, please specify: ______________________________

11 C: Shipments of ore or solutions in 1986:

1 To Concentrate production plant: U_3O_8 ______________ Pounds
Plant Name(s) ______________________________ Plant Location ______________________________

2 To other site or facility: U_3O_8 ______________ Pounds
Site/Facility Name(s) ______________________________ Site/Facility Location ______________________________

Item 11 D: Additional Comments: Schedule A, Part IV:

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Schedule A

tion

Schedule A: Part V: Conventional Uranium Concentrate Production e beginning of Schedule A.

If Schedule A, Part V is Not Applicable to the activities of your firm please check the box at right. If Part V is applicable, continue with the next Item below.

☐ **NOT APPLICABLE**

Item 12: Uranium Milling

Item 12: Data on active and inactive uranium mills and conventional concentrate production controlled by your company during 1986 are requested under Item 12 below. Refer to the definition of Controller on page 3.

Pages 15 through 17 may be preprinted with information on uranium mills and concentrate production reported by your firm and other sources. Please review all preprinted information, and update, change, or correct it as necessary to report information for 1986 for each mill and its concentrate production.

Please also report data for additional milling operations, but for which no pages with preprinted information are supplied. Report data on the location and status for each closed conventional mill. Please photocopy pages 15 through 17 as necessary to report separately on each additional milling operation, and append the new pages at the end of Part V. One set of "blank" pages 15 through 17 is provided.

12: Mill Description

A 1 Name of Mill: ______________________ **2 Other Name(s), if any:** ______________________
(Other commonly used name of the mill)

B Type of Facility:

1) ☐ **Conventional Uranium Mill** 2) ☐ **Other (Specify)** ______________________

C Location: Enter the following location information as appropriate. Enter the latitude and longitude to the nearest degree and minute that approximate the geographical center of the mill site.

1 State: ______________________ **2 County:** ______________________

3

Section(s)	Township(s) N. or S.	Range(s) E. or W.	Latitude N.	Longitude W.
			N.	W.

4 Principal Meridian: ______________________

5 State Milling License/Permit Number: ______________________

6 Mine Safety and Health Administration (MSHA) Identification Number: ______________________

and MSHA Name: ______________________

D Ownership: List all firms having joint or partial ownership in this mill and percentage of ownership.

Name of Firm:	**Percentage of Ownership**
1) ______________________	______________ %
2) ______________________	______________ %
3) ______________________	______________ %
4) ______________________	______________ %

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Mill I.D. ☐☐☐☐☐☐☐☐

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Schedule A

Schedule A: Part V: (continued)

Item 12: Conventional Uranium Concentrate Production (continued)

E If you are no longer the owner or controller of this mill, please give the name of the present controller or the person to whom the title of this mill was transferred:

Company Name: ____________________

Street Address: ____________________

City: ____________ State: ________ Zip Code: ____________

What is the nature of the arrangement with the above company?

- a Title Transfer ☐
- b Contract ☐
- c Lease ☐
- d Other Arrangement ☐ (please specify) ____________

F Rated Capacity:

1 Conventional Mill: ____________ tons of ore per day

2 Other: ____________ pounds of U_3O_8 per year

3 Optimal Number of Working Days per year mill is designed to operate: ________ days

G Facility Status: 1 Total working hours mill was operated to produce concentrate in 1986:

________ hours

2 Was the mill operating throughout 1986? (Operated normally except for planned holiday/vacation periods and routine maintenance)

Yes ☐ No ☐

3 If answer to G 2 is No, give month and year of mill closing: ________Mo ________Yr

4 If the mill was closed in 1986 or earlier, was it closed:

- ☐ Temporarily (planned to be reopened during 1987)
- ☐ Indefinitely (not planned to be reopened during 1987)
- ☐ Permanently (will not be reopened)
- ☐ Reclaimed (reclamation in progress or completed)

5 If Temporarily closed, give month of planned reopening ________Mo, 1987

6 If the mill is closed, give holding (standby) cost: $____________ /Yr

7 If the mill is closed, give estimated one time cost of reopening: $ ____________

8 If the decision were made today to reopen the mill, how many months would be required to bring it into production?

________ Mos.

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Uranium Industry Annual Survey
Schedule A

Schedule A: Part V: (continued)

Item 12 Conventional Uranium Concentrate Production (continued)

H Uranium Milling Operations in 1986:

	Ore Feed-to-Process		Other Mill Feed[7]	In-Process Inventories Pounds U_3O_8		Theoretical Production at 100 Percent Recovery Pounds U_3O_8
	Tons of Ore	Pounds U_3O_8	Pounds U_3O_8	on 12/31/85	on 12/31/86	
Conventional Mill						

Concentrate Production Pounds U_3O_8	Tailings and Unaccountable Pounds U_3O_8	Recovery From Ore Percent

Concentrate Inventories Pounds U_3O_8		Concentrate Shipped Pounds U_3O_8
on 12/31/85	on 12/31/86	

[7] Please indicate all sources of "Other Mill Feed".

Mine water ☐

Heap leach ☐

Tailings water ☐

Water treatment plant ☐

Other ☐

I Additional Comments: Schedule A, Part V

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Plant I.D.	

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Schedule A

Schedule A: Part VI: Nonconventional Uranium Concentrate Production:

Who Must Respond: Refer to the criteria for Part VI listed on Page 3 at the beginning of Schedule A.

If Schedule A, Part VI is Not Applicable to the activities of your firm please check the box at right. If Part VI is applicable, continue with the next Item below. ☐ NOT APPLICABLE

Item 13: **Nonconventional Uranium Concentrate Production**

Item 13: Data on active and inactive nonconventional concentrate plants and nonconventional concentrate production controlled by your company during 1986 are requested under Item 13 below. Refer to the definition of Controller on page 3.

Pages 18 and 19 may be preprinted with information on nonconventional uranium plants and concentrate production reported by your firm and other sources. Please review all preprinted information, and update, change, or correct it as necessary to report information for 1986 for each nonconventional plant controlled by your company during 1986.

Please also report data for additional nonconventional concentrate production, but for which no pages with preprinted information are supplied. Report data on the location and status of each closed nonconventional plant. Please photocopy pages 18 and 19 as necessary to report separately on each additional nonconventional uranium concentrate production operation, and append the new pages at the end of Part VI. One set of "blank" pages 18 and 19 is provided.

13: Processing Plant Description

A 1 Name of Plant: ______________________

2 Other Name(s), if any: ______________________
(any other commonly used name of the plant)

B Type of Facility

1 ☐ *In situ* Leach Solution Processing 2 ☐ Byproduct Recovery 3 ☐ Other (Specify) ______________

C Location: Enter the following location information as appropriate. Enter the latitude and longitude to the nearest degree and minute that approximate the geographical center of the plant site.

1 State: ______________ **2 County:** ______________

3

Section(s)	Township(s) N. or S.	Range(s) E. or W.	Latitude N.	Longitude W.
			N.	W.

4 Principal Meridian: ______________________

5 State Milling License/Permit Number: ______________________

6 Mine Safety and Health Administration (MSHA) Identification Number: ______________

and MSHA Name: ______________________

D Ownership: List all firms having joint or partial ownership in this plant and percentage of ownership.

Name of Firm:	Percentage of Ownership
1)	%
2)	%
3)	%
4)	%

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Plant I.D. ☐☐☐☐☐☐☐☐☐☐

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Schedule A

Schedule A: Part VI: (continued)

Item 13: Nonconventional Uranium Concentrate Production (continued)

E If you are no longer the owner or controller of this plant, please give the name of the present controller or the person to whom the title of this plant was transferred:

Company Name: ______________________________

Street Address: ______________________________

City: ______________ **State:** ________ **Zip Code:** ________

What is the nature of the arrangement with the above company?

a Title Transfer ☐
b Contract ☐
c Lease ☐
d Other Arrangement ☐ **(please specify)** ______________

F Rated Capacity:

1 *In situ*, byproduct, or other plant: ______________ **pounds of U_3O_8 per year**

2 Optimal number of working days per year plant is designed to operate: ________ **days**

G Facility Status: 1 Total working hours plant was operated to produce concentrate in 1986:

________ **hours**

2 Was the plant operating throughout 1986? (Operated normally except for planned holiday/vacation periods and routine maintenance.)

Yes ☐ **No** ☐

3 If answer to G 2 is No, give month and year of plant closing: ____ **Mo** ____ **Yr**

4 If the plant was closed in 1986 or earlier, was it closed:

☐ **Temporarily (planned to be reopened during 1987.)**
☐ **Indefinitely (not planned to be reopened during 1987.)**
☐ **Permanently (will not be reopened.)**
☐ **Reclaimed (reclamation in progress or completed.)**

5 If temporarily closed, give month of planned reopening ____ **Mo, 1987**

6 If the plant is closed, give holding (standby) cost: $ ________ **/Yr**

7 If the plant is closed, give estimated one time cost of reopening: $ ________

8 If the decision were made today to reopen the plant, how many months would be required to bring it into production?

________ **Mos.**

H Uranium Processing Operations in 1986: Nonconventional Plant (*in situ* leaching and byproduct plants and other nonconventional plants)

Total Plant Feed Pounds U_3O_8	Concentrate Production Pounds U_3O_8	Concentrate Inventories Pounds U_3O_8		Concentrate Shipped Pounds U_3O_8 during 1986
		on 12/31/85	on 12/31/86	

I Additional Comments: Schedule A, Part VI

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Schedule A

Schedule A: Part VII: Uranium Industry Employment

Who Must Respond: Refer to the criteria for Part VII listed on Page 3 at the beginning of Schedule A.

If Schedule A, Part VII is not applicable to the activities of your firm please check the box at right. If Part VII is applicable, continue with the next Item below. ☐ NOT APPLICABLE

Item 14: In the table below, enter by State the number of person-years expended on exploration projects controlled by your company in 1986. Include the totals for person-years for contracted manpower in exploration work.

Employment in Uranium Exploration in 1986 in Person-Years Expended

State	Person-Years
Arizona	
Colorado	
Nebraska	
New Mexico	
Texas	
Utah	
Wyoming	
Other States (Please specify)	
Total	

Item 15: Enter by State the number of person-years expended in uranium mining, milling, and processing by your company in 1986. Include the totals for person years for contracted manpower. Processing includes in situ, byproduct, and other nonconventional recovery operations.

Employment in Uranium Mining, Milling and Processing in 1986 in Person-Years Expended

State	A Mining (Person-Years)	B Milling (Person-Years)	C Processing (Person-Years)	Totals (Person-Years)
Arizona				
Colorado				
Florida				
Nebraska				
New Mexico				
Texas				
Utah				
Washington				
Wyoming				
Other States (Please specify)				
Totals				

Item 16: Additional Comments for Schedule A, Part VII

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Schedule B

Schedule B: Uranium Marketing Activities - General Instructions

Criteria for Schedule B concerning Who Must Respond:

1. Firms that purchase, sell, or own domestic- or foreign-origin uranium.

If no part of Schedule B is applicable to your firm, please check the box at the right and complete the certification below.

☐ NOT APPLICABLE

Certification Statement - I certify that the historical and estimated information provided herein and appended hereto are true and accurate to the best of my knowledge, information and belief. Title 18 U.S.C. 1001 makes it a criminal offense for any person knowingly and willingly to make to any agency or department of the United States any false or fraudulent statements as to any matter within its jurisdiction.

Certifying signature for Schedule B: ____________________ Date: ____________

Name of Certifying Official (Please Print): Mr., Mrs., Ms. ____________________

Title: ____________________

Name of Contact Person for Schedule B: ____________________
Company Name: ____________________ Phone: ( ) ____________
Street Address: ____________________
City: ____________ State: ____________ Zip: ____________
Parent Company ____________________

Please complete the above section if the address for the contact person is different from that shown on page 1. Mail Schedule B (whether or not it is applicable to your firm) with Schedule A to the following address:

Energy Information Administration, EI-53
Mail Station, Forrestal BG-094
U. S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

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Uranium Industry Annual Survey
Schedule B

General Instructions: (continued):

Item 1: Market Commitments: Please report in Item 1 each market commitment (contract) that your company had in place on December 31, 1986 or completed during the 1986 calendar year. Market commitments should include all sales, purchases, loans, loan repayments, or exchanges. Preprinted data for each market commitment, containing the name of the other party, the date the contract was signed, the type of transaction and other data, was prepared for your review from your company's reporting of these data for 1985. Please correct any errors that may appear in the preprinted data and complete the remaining items on the pages. A blank copy of page 24 is also included so that you may complete Item 1 for records of contracts signed prior to December 31, 1985 that are still active, for which no preprinted page was provided, and for contracts signed in 1986. Photocopies of page 24 may be appended as necessary to report the information on all current market commitments.

In completing Item 1, please note that the EIA must be able to account for all transfers of title to uranium, and that a sale or purchase of separative work-units (SWU) in the secondary market constitutes, under certain conditions, such a transfer. If you have purchased or sold SWU by assignment of an enrichment contract, you need not report such a transfer. If you have purchased or sold SWU by, in effect, transferring title of enriched uranium for natural uranium, report this in item 1C as an exchange.

Item 1 C Transaction Type: Indicate whether the contract is a "Sale," "Purchase," "Exchange," "Loan," or "Loan Repayment" by placing an "X" in the appropriate box. For loans and loan repayments, please indicate whether your company was the lender or the borrower by placing an "X" in the appropriate box. Purchases or sales of SWU by, in effect, transferring title of enriched uranium for natural uranium (or vice-versa) should be reported as an exchange.

Item 1 D Country of Origin: Provide the "Country of Origin" of the uranium (or SWU transfer agreement) for the actual deliveries. Country of origin refers to the country in which the material was produced. For SWU, the country of origin refers to the country in which the enrichment takes place. For deliveries in 1987 and beyond, enter the country of origin as specified in the contract. If the contract specifies any applicable DOE limit for enrichment of foreign-origin uranium as the maximum foreign fraction of the contracted quantity, and it does not specify a country of origin, write in "DOE Limit." If the contract does not specify either a country of origin or a DOE Limit, write in "Unspecified" for the country of origin.

Item 1 D Imports: If the country of origin is a foreign country and your company is RECEIVING material in this contract, please indicate if this is an "import" contract by checking the appropriate box. An import of material is defined as the "physical movement" of material from outside the United States into the United States but does not include loans or loan repayments in the secondary market. If your company is buying material from a foreign company but is taking title of the material after it has entered the United States, this is considered an import. If you are receiving foreign-origin material from a U.S. company whereby the material was already in the U.S., this is not considered an import by your company. In this instance, the U.S. company selling to your company will report the import of material in its response to this survey. Foreign-origin material purchased, borrowed or exchanged by your company that does not enter the U.S. but is sent directly to another foreign country should not be indicated as an import.

Item 1 E Country of Destination: Provide the "Country of Destination" for the actual and estimated uranium commitments (or SWU transfer agreement). Country of destination refers to the country to which the material will be ultimately delivered in this contract.

If the country of destination is a foreign country and your company is SENDING material in this contract, please indicate if this is an export contract by checking the appropriate box. An export of material is defined as the "physical movement" of material from within the United States to outside the United States, but does not include loans or loan repayments in the secondary market. If your company is selling material to a foreign company and that foreign company is taking title to the material in the United States but will then ship it from the United States, this is considered an export.

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Schedule B

Instructions: (continued)

Item 1 F Pricing Mechanism: Indicate the type of price determination by placing an "X" in the appropriate box. A "Contract-Specified" price commitment is one in which the price (either a "Fixed Price" or a "Base Price" with escalation factors) is determined when the contract is signed. This includes spot-market purchases. In "Market-Price-Related" contracts, prices are commonly determined at or before delivery and are based on prevailing prices. If the price is (to be) tied to an external indicator (such as a published spot price), please mark the settlement mode as "External-Indicator." If the price is settled by arm's-length negotiation, indicate settlement mode as "Negotiated." A market-related commitment may have either an explicit floor price or a cost-related floor. Please indicate the status of the floor in your market-price contracts. Prices in some contracts are defined as the higher of base-price escalated or market price. For the purpose of this survey, these types of contracts should be reported as "Market-Price-Related" with a "Floor Price" rather than "Contract Specified." If you are reporting prices for uranium contracts with complex pricing mechanisms that do not fall readily into "contract" or "market price" categories, please check the box labeled "Other" and describe the pricing mechanism in the additional comments space at the end of Schedule B. The pricing mechanism for a captive operation is always "Other." If any of your procurement is under contract price arrangements for certain years or portions thereof and under market price arrangements for other years or portions thereof, please fill out separate forms for the relevant contractual quantities and prices, or indicate on the form which quantities and prices in which years are under each type of procurement.

Item 1 G: If optional deliveries are specified in the contract, indicate if they are "Buyer" or "Seller" options by placing an "X" in the appropriate box.

Item 1 H: If this contract is (was) under litigation, indicate the current status by placing an "X" in the appropriate box.

Item 1 J: Please enter the actual quantities of uranium in thousand pounds of U_3O_8 equivalent which changed ownership during calendar 1986 and the firm and/or optional market commitments in the contract for delivery in 1987 and beyond. If more than one material type is involved for any given year, please indicate the amount of each material type. (If enriched UF_6, express in U_3O_8 equivalent assuming 0.2 percent enrichment tails assay.)

If the contract is a "Market-Price" procurement, and the price was settled for deliveries in 1986 and/or 1987 by December 31, 1986, enter the quantities in the "Settled Price" row. Enter the quantities for which the price was not settled by December 31, 1986 in the "Not Settled Price" row. For a "Contract-Price" procurement and "Other" procurement, the quantity for 1986 deliveries should be entered in the "Settled Price" row.

Item 1 K, 1 L, and 1 M: Please enter the actual price per pound U_3O_8 your company will receive or pay for 1986 and/or 1987 deliveries, and the estimated or fixed prices for deliveries in 1988 and beyond. The prices should be entered in the column corresponding to the type of pricing mechanism as indicated in Item 1 F. If your contract is quoted in UF_6 or other terms, please convert to equivalent U_3O_8 values net of the UF_6 conversion cost. Please list prices in both non-escalated (no escalation after January 1, 1987) and escalated dollars. That is, assume both zero for the contract escalators, and your best estimate of the escalators. The escalated column should contain the actual price paid or received (for 1986 and 1987 deliveries where appropriate) and your estimate of the future price based upon the price escalation factors specified in the contract. If there are no escalation factors (i.e., fixed price), the escalated and non-escalated columns should be equal. If the price is not settled in a market-price contract, enter the floor price (if applicable). Escalated and non-escalated floor prices should be entered when appropriate. If the floor price is related explicity to the seller's cost of production, and the cost of production cannot be estimated, indicate as "cost" in the price column. If the price is not settled in a market-price contract without a floor, leave item K blank, but report quantities in Item 1 J. Prices need not be reported for exchanges, loans, loan repayments, and captive production.

Item 1 N: If this contract has a contract-specified price with price escalation or is a market-price related contract with an escalated price floor, please list in the space below the price indices used and the percent of the base price to which each price index applies (e.g., Wholesale Price Index for Industrial Commodities, 50% of the base price). If there is a fixed component of the base price that is not escalated, please indicate that amount. Some typical price indices are listed for your use as appropriate on page 25.

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Contract I.D. ☐☐☐☐☐☐☐☐☐☐

U. S. Department of Energy
Energy Information Administration
Uranium Industry Annual Survey

Schedule B: Uranium Marketing Activities

☐ If not applicable check box

(1) Market Commitments: (Use one form per commitment. Photocopy as necessary.)

A. Name of Other Party:

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B. Date Contract Signed: ______ Month/Year

C. Transaction Type: ☐ Sale ☐ Purchase ☐ Exchange
☐ Loan (☐ Lender ☐ Borrower) ☐ Loan Repayment (☐ Lender ☐ Borrower)

D. Country of Origin for Actual Deliveries: ______
Country of Origin for Future Deliveries: ______

If foreign origin and your company is receiving material in this contract, please indicate if this is an import by your company. (See Instructions for definition of imports.)
☐ Yes ☐ No

E. Country of Destination for Actual Deliveries: ______
Country of Destination for Future Deliveries: ______

If foreign destination and your company is sending material in this contract, please indicate if this is an export by your company. (See Instructions for definition of exports.)
☐ Yes ☐ No

F. Pricing Mechanism:
☐ Contract-Specified . . . . ☐ Fixed Price ☐ Base Price Escalated
☐ Market-Price Related
Settlement Mode . . . . . ☐ External Indicator ☐ Negotiated
Floor Type . . . . ☐ Fixed Floor Price ☐ Escalated Floor Price
☐ Cost Floor ☐ No Floor
Ceiling Price . . . . ☐ Yes ☐ No
☐ Other (Explain pricing mechanism in Item 7, Page 29)

G. If optional quantities are specified in the contract, check appropriate box:
☐ Buyer's Option ☐ Seller's Option

H. If this contract is (was) under litigation, check the appropriate box:
☐ Litigation Settlement
☐ In Litigation

I. Material Type: (If this is an exchange, please indicate material received and material sent)
☐ Enriched Uranium ☐ Natural UF_6 ☐ Natural U_3O_8 ☐ Ore Reserves

Year of Delivery	J. Quantity (Thousand Pounds U_3O_8)		K. Market Price Procurement ($ per pound U_3O_8)			L. Contract Price Procurement ($ per pound U_3O_8)		M. Other Procurement ($ per pound U_3O_8)
			Settled Price	Floor Price (If Applicable)				
	Firm	Optional		Escalated	Non-Escalated	Escalated	Non-Escalated	
1986 Settled Price		▨						
1986 Not Settled Price		▨						
1987 Settled Price		▨						
1987 Not Settled Price								
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995								
1996								
1997								
1998								
1999								
2000								
2001 & Beyond								

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Uranium Industry Annual Survey
Schedule B

Item 1: Market Commitments: (continued)

N	Price Index Used	Percent of Base Price	$ Value of Fixed Component
1	Average Hourly Earnings - Chemical & Allied Products		
2	Average Hourly Earnings - Mining Industry		
3	Average Hourly Earnings - Production Workers, Metal Mining		
4	Chemical Workers' Wages		
5	Consumer Price Index		
6	Mining Wages		
7	G.N.P. Implicit Price Deflator		
8	NUEXCO Exchange Value		
9	Producer Price Index		
10	Producer Price Index - Electrical Power, Industry		
11	Producer Price Index - Industrial Chemical		
12	Producer Price Index - Industrial Commodities		
13	Producer Price Index - Mining, Machinery, & Equipment		
14	Producer Price Index - Petroleum Products Refined		
15	Standard Industrial Code 10		
16	Standard Industrial Code 28		
17	Wholesale Price Index - Chemical & Allied Products		
18	Wholesale Price Index - Industrial Commodities		
19	Others - Please Specify		
20			
21			
22			
23			
24			
25			
26			
27			
28			
31			

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Energy Information Administration
Uranium Industry Annual Survey
Schedule B

Item 2: Quantity of Uncommitted Uranium Available for Sale (Thousand Pounds of U_3O_8 Equivalent) At or Below Specified Prices.

Instructions for utilities:

Utilities should enter excess inventory and/or purchase commitments above reactor and inventory requirements. For each year, quantities are cumulative and should include the uncommitted uranium available at lower prices. Assume prices in December 31, 1986 constant dollars (e.g., the prices indicated in the column heading would increase after December 31, 1986 at the general rate of monetary inflation) and that all uranium will be sold in the same year it becomes available for sale.

Instructions for suppliers:

The purpose of this question is to obtain an estimate of the quantity of uranium your firm could make available for sale over the period 1987-1996 from excess inventory, and current and potential production capability. The quantity for sale should be over and above your current firm and optional market commitments reported in Question 1. In making this estimate, consider your cost and production constraints (e.g., the time needed to develop and open a new mine, reopen shutdown facilities, physical yearly production rates of new and/or existing mines, etc.). For each year, quantities are cumulative and should include the uncommitted uranium available at lower prices. Assume prices in December 31, 1986 constant dollars (e.g., that the prices indicated in the column heading would increase after December 31, 1986 at the general rate of monetary inflation) and that all uranium will be sold in the same year it is produced.

Quantity of Uncommitted Uranium Available for Sale (Thousand Pounds of U_3O_8 Equivalent)

Year	$20 or Less	$30 or Less	$40 or Less	$50 or Less	$60 or Less	Unlimited Price
1987						
1988						
1989						
1990						
1991						
1992						
1993						
1994						
1995						
1996						

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Uranium Industry Annual Survey
Schedule B

Item 3: Uranium Inventories - Please list the uranium inventories to which your company had title as of December 31, 1986 (including material under a financial lease).

- a U_3O_8 on hand, in off-site storage, or at conversion plants.
- b Natural UF_6 on hand, in private off-site storage, or at conversion plants.
- c UF_6 (natural or enriched) at enrichment suppliers (exclude natural UF_6 under usage agreements).
- d Enriched UF_6 on hand, and/or in private storage.
- e Fabricated fuel not inserted into a reactor.
- f Natural UF_6 your company has delivered to DOE enrichment suppliers under usage agreements.

In completing this question please be certain that the 1986 end-of-year inventory is consistent with the inventory reported last year and with information provided in other parts of this form. This means that this year's inventory should reflect last year's reported inventory plus additions to stock from production, purchases, etc., minus decreases in stocks through sales, usage, etc., as reported in other parts of this form. The inventory that you reported as of December 31, 1985 is shown to help you maintain this consistency. Please note below revisions to the year-end 1985 inventory.

Uranium Inventories

Type of Inventory	Domestic-Origin (1000 lbs of U_3O_8 Equivalent)		Foreign-Origin (1000 lbs of U_3O_8 Equivalent)	
	As of Year-end 1985	As of Year-end 1986	As of Year-end 1985	As of Year-end 1986
a U_3O_8				
b Natural UF_6				
c UF_6 (natural and enriched) at enrichment suppliers; exclude natural UF_6 under usage agreements				
d Enriched UF_6				
e Fabricated Fuel				
f Natural UF_6 Under DOE Usage Agreement				

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Energy Information Administration
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Item 4: For Utilities Only - If your company has an inventory policy, enter the desired level of inventory for each type of uranium in terms of months of forward coverage.

Check the box if your company has no inventory policy on any form of uranium. ☐

Desired level of inventory is defined as the amount of uranium that your company feels is needed as a contingency supply to meet your conversion, enrichment, fabrication, and reactor loading schedules in the event of a complete shortage. Desired level does not include pipeline inventories. The quantities for each category should be additive (i.e., their sum should equal total desired uranium inventory).

Forward coverage is defined as the time (measured in months) that this inventory could be used to meet your conversion, enrichment, fabrication or reactor loading schedules in the event of a complete shortage.

Type of Inventory	Desired Levels of Inventories	
	Months of Forward Coverage	Thousand Pounds U_3O_8 Equivalent
a U_3O_8		
b Natural UF_6		
c Enriched UF_6		
d Fabricated Fuel		

Item 5: ·Actual **Uranium Enrichment Feed Deliveries in 1986** - Enter below the quantity of uranium feed (in thousand pounds U_3O_8 equivalent) of U.S.-origin and foreign-origin uranium that was shipped to the U.S. Department of Energy (DOE) enrichment plants in 1986. Also enter the quantity of uranium feed that was shipped to non-U.S. enrichment suppliers. Include as a separate item the U_3O_8 equivalent of U.S. DOE separative work units (SWU's) that your company purchased in the secondary market in 1986, or received in exchange for natural uranium in 1986.

When completing this table do not include deliveries to DOE that are placed in your usage agreement account and are not intended for withdrawal until the next calendar year or later. However, withdrawals of enriched uranium from your usage agreement account should be included, as appropriate, in your response to line a or line b.

Classification of Uranium Shipments to Enrichment Plants in 1986	Quantity (1000 Pounds U_3O_8 Equivalent)
a) Shipment of U.S.-origin material to U.S. DOE enrichment plants	
b) Shipment of foreign-origin material to U.S. DOE enrichment plants Source: Australia	
Source: Canada	
Source: South Africa	
Source: Other (Please Specify): ____________	
c) Shipment of U.S.-origin material to non-U.S. enrichment suppliers (including secondary SWU purchases or received in exchange)	
d) Shipment of foreign-origin material to non-U.S. enrichment suppliers (including secondary SWU purchases or received in exchange)	
e) U_3O_8 Equivalent of secondary SWU purchases or received in exchange (for U.S. DOE enrichment only)	
f) Total (a+b+c+d+e)	

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Item 6: Projected Uranium Enrichment Feed Deliveries and Unfilled Market Requirements

Enter in column A the projected shipments to your enrichment suppliers (both U.S. DOE and non-U.S. suppliers). Include the quantity of enriched uranium (SWU) that your company will receive in exchange for natural uranium in all exchange contracts your company currently has in place. Exclude the quantity of shipments to enrichment suppliers that are scheduled for a cancelled reactor unless the enriched uranium is to be used in another of your company's reactors. In column B, enter the quantity of unfilled requirements. Unfilled requirements are defined as the amount of uranium your company needs, over and above the current inventory and uranium purchase contracts to meet the projected uranium enrichment feed deliveries shown in column A and to maintain a "desired" level of inventory.

Enrichment Feed Deliveries and Unfilled Market Requirements (Thousand pounds U_3O_8 Equivalent)

Year	A Projected Shipments to Enrichment Suppliers	B Unfilled Market Requirements
1987		
1988		
1989		
1990		
1991		
1992		
1993		
1994		
1995		
1996		

Item 7: Additional comments for Schedule B: Uranium Marketing Activities.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Company Name: ______________________________

Data on this mandatory survey are collected under the authority of Section 170B of the Atomic Energy Act of 1954, as amended (42 U.S.C. 790a) and the Federal Energy Administration Act of 1974 (15 U.S.C. 2210b). Late filing, failure to keep records, or failure otherwise to comply with these instructions may result in criminal fines, civil penalties, and other sanctions as provided by law. Provisions concerning confidentiality of the data collected are explained in the instructions.

Who Must Respond

Your company* must respond to Parts I, II, III, and IV of this Schedule if, in 1986, it was involved in resource ownership, exploration, development, mining, milling, or other beneficiation activities, directed specifically toward the ultimate production of uranium from mineral deposits located in the United States, to be offered for sale in the commercial marketplace and if it meets any one of these size criteria:

1. **Your company held net investment in place in 1986 in the domestic uranium industry in excess of $5 million either as an operator or non-operator equity partner;**
2. **Your company held domestic uranium inventories in excess of $5 million at the beginning of 1986;**
3. **Your company has future delivery commitments at year end 1986 in excess of $5 million.**

*Definition: The term "company," as used here, includes any corporation, operating subsidiary, unconsolidated affiliate, partnership, joint venture, privately-held company or unincorporated business.

Companies which are involved in more than one venture that do not meet the reporting size criteria individually but do so in the aggregate are required to report. If the company is inactive or exited the industry in 1986 but satisfies the above general and size criteria at the beginning of the year, Schedule C must be completed.

If your company does not meet the filing requirement, briefly explain the current status of your involvement in the domestic uranium industry in the box below.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

If no part of Schedule C is applicable to your company, please check the box at right and complete the certification below. ☐ **NOT APPLICABLE**

Provisions regarding confidentiality of information: The Energy Information Administration (EIA) has determined that the data furnished on individual company uranium exploration, development, reserves, production, operations, uranium industry financial information, and marketing activities may constitute commercial information as specified in the Freedom of Information Act (5 U.S.C. 552). The EIA has taken the position that such individual company data will be kept confidential to the maximum extent permitted by the Freedom of Information Act and the Trade Secrets Act (18 U.S.C. 1905).

Certification Statement—Title 18 U.S.C. 1001 makes it a criminal offense for any person knowingly and willingly to make to any agency or department of the United States any false or fraudulent statements as to any matter within its jurisdiction. I certify that the historical information provided hereto is true and accurate to the best of my knowledge, information, and belief.

Certifying Signature for Schedule C: ______________________ **Date:** ____________

Name of Certifying Official (Please Print) **Mr. Mrs. Ms.** ______________________

Title: ______________________

Please review and correct the contact name and address information printed below.

Name of Contact Person for Schedule C:

(Please Print) Mr. Mrs. Ms. ______________________ Phone: (   ) ____________

Company Name: ______________________

Street Address: ______________________

City: ______________ State: ____________ Zip: ____________

Parent Company: ______________________

Mail Schedule C (whether or not it is applicable to your company) in the business-reply envelope provided to the following address.

Energy Information Administration, EI-53
Mail Station, Forrestal BG-094
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20077-9381

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status—General Instructions

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Reporting Period

All financial data should be based on the most recently completed accounting year. This is presumed to be December 31, 1986, unless otherwise stated.

Reporting Conventions

All dollar amounts should be recorded to the nearest thousand dollars. Use negative sign conventions (minus sign or brackets) if the amount being represented is the opposite of the normal expected balance. For example, liability and equity amounts should not be bracketed unless they are opposite of the normal expected positive amount. Other revenue and expense on Item 68 should be bracketed only if it increases income. The tax expense item should be bracketed if it represents a benefit (a reduction of the pretax loss).

Use of Exhibits

The following information must be provided as exhibits to the completed survey:

Exhibit A: Background information on the reporting company's accounting and financial reporting policies including principles of consolidation and policies on capitalizing and expensing exploration and development expenditures.

Exhibit B: Explanation of the procedures used to allocate or assign consolidated financial data to the domestic uranium segment.

Exhibit C: A copy of the annual report and 10-K filed with the Securities and Exchange Commission for the reporting period. If the company is a subsidiary of a parent company, it must submit the parent's annual report and 10-K.

Use of Generally Accepted Accounting Principles (GAAP)

In completing Schedule C, reporting companies should follow the accounting principles they currently use to prepare financial statements. A brief explanation of these principles should be prepared on a separate sheet of paper and attached as Exhibit A. The presumption is that your company's accounting principles are consistent with GAAP and, if available, may be copied directly from the company's financial reports.

Consolidated Financial Data (Column A)

Publicly-Held Companies

In completing Column A (Consolidated Level), publicly-held companies have the option of taking the information from the balance sheet, income statement, and statement of changes in financial position reported in their annual report (or 10-K), or taking the information from the accounting reports of their operating subsidiary in which the domestic uranium activities are conducted. However, if your involvement in the domestic uranium industry is not fully or porportionately consolidated or you are a partner or joint venturer, follow the reporting requirements outlined for all other companies.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status—General Instructions (continued)

All Other Companies

In completing Column A (Consolidated Level), unconsolidated affiliates, partnerships, joint ventures and privately-held companies should use the balance sheet, income statement, and statement of changes in financial position of the company in which the domestic uranium business is conducted, taken as a whole, and not just report on the domestic uranium sector data only. The domestic uranium data should be reported in Column B (Uranium Sector Only). For example, if two or more companies are involved in the same venture, the general partner, operator or controller of the venture should report the financial activities of the entire venture, not its percent interest only. If the venture involves domestic uranium activities only, Columns A and B would be the same except that Column B requires disaggregation of certain financial data. The equity or non-operating interest partners need report only the financial data in Column A and B consistent with their normal reporting practice in their annual report and 10-K filing.

Domestic Uranium Sector Data (Column B)

Information in this column should be specific to the domestic uranium segment only. Reasonable allocation methods for data elements may be used where they are not separately identifiable in your accounting records. Exhibit B should be used to explain allocation methods used. In addition, where a company reports items that are material to its financial position using accounting principles that are unusual or different from GAAP and industry practice, it should explain these differences in Exhibit B.

Item Explanations

The explanations of amounts to be reported in each of the items on the attached form are considered self explanatory unless a specific instruction is given. Explanations intended for uranium sector data are separately identified as "Column B Only" instructions.

Schedule C: Uranium Industry Financial Status—Specific Instructions

Part I: Balance Sheet

Current Assets

Item 1—Report total inventories of all items consistent with normal reporting practice. For Column B only, report the book value of domestic uranium raw materials and products, materials and supplies. In Exhibit B, state the method used for valuing inventory (cost or market—lifo/fifo etc.) and, if there have been any writedowns during the year, state the amount and the item number from Part IV where these writedown amounts have been included.

Item 2—This is a residual amount which is all other current assets including cash, short-term securities, and receivables. For Column B only, report all other current assets that can be directly associated with the domestic uranium sector.

Item 3—This item is the sum of Items 1 and 2.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status—Specific Instructions (continued)

Items 4 through 7—For Column A, report total investment in property, plant and equipment in Item 7. For Column B, disaggregate the domestic uranium gross book value of capitalized investment into each of the four asset categories. In Item 7, All Other Property, Plant, and Equipment (PP&E), include uranium sector PP&E that cannot be otherwise classified in Items 4 through 6.

Item 8—For Column B only, report the gross accumulated depletion, depreciation, and amortization (DD&A) amount taken on Items 4 through 7. If this amount includes extraordinary writedowns, the amount of the writedowns, year, and asset category (i.e., Items 4 through 7) should be disclosed in Exhibit B. Do not include any accumulated DD&A associated with Idle Facilities (Item 10). Item 8 should be shown as a positive number.

Item 9—This item is the sum of Items 4 through 7 minus Item 8.

Item 10—For Column B only, report only net book value of idle facilities not otherwise reported in Items 4 through 7. The amount should be net of any accumulated DD&A and extraordinary writedowns.

Item 11—For Column B only, report only the net investment in domestic uranium reserves and exploration, development, and production mining and milling operations, including partnerships and joint ventures. In Exhibit B, list the name of the unconsolidated operation or venture, percent interest and net investment amount. If your normal practice is to report joint venture investments as proportional interest in property, plant and equipment, and have reported such amounts in Items 4 through 7, it should be disclosed in Exhibit B.

Item 12—For Column B only, report only the net value of any other non-current assets that can be directly associated with domestic uranium reserves, exploration, development, production, or marketing commitments.

Item 13—This item is the sum of Items 9 through 12.

Item 14—This item is the total of Items 3 and 13.

Items 15 through 19—These items are, for the most part, self explanatory. Item 16 should include debt from external sources as well as parent and affiliate organizations. Item 17 is a residual category of all other deferred items. Item 18 is the total of Items 16 and 17. Item 19 is the total of Items 15 and 18. For Column B only, report current and total long-term and deferred liabilities that can be specifically identified with domestic uranium activities.

Items 20 through 23—Item 20 should include permanent capital contributions from investing stockholders, partners or venturers. Item 22 should include the cumulative balance of earnings and losses net of any distributions to stockholders, equity partners or venturers. Item 21 is a residual category of cumulative adjustments to equity accounts. Item 23 is the sum of Items 20 through 22. For Column B only, report only those items that can be specifically identified with the domestic uranium activities on Item 23.

Item 24—This item is the total of Items 19 and 23. It should also be equal to Item 14.

Item 25—Fill out as specified.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status—Specific Instructions (continued)

Part II: Sources and Uses of Funds

Item 26—The amount reported here should agree with the reported amount on Item 71 or 73 of the Income Statement. If the amount used for this item varies from either one of these income statement items, please include an explanation in Exhibit B.

Item 27—The amount reported here should normally agree with Item 63 on the income statement. If it does not, please include an explanation in Exhibit B.

Item 28—If the reported amount of deferred tax expense (benefit) is, in effect, a use of funds or negative source, please include an explanation in Exhibit B as to the circumstances creating the negative deferral.

Item 29—The amount reported here should be the total of all other items from the income statement that increase working capital from operations. For Column B only, the amount reported here should be the total of those items included in Column A that are specifically related to your company's domestic uranium operations. For example, there could be special writedowns of assets not reported in Item 27.

Item 30—This item is the sum of Items 26 through 29.

Item 31—The amount reported on this line should include only the net book value of dispositions upon sale or transfer of property, plant and equipment and not extraordinary retirements or writedowns. Gain or Loss on such transaction(s) normally flows through from the income statement and should be reflected in the net income (loss) reported in Items 26 and 73. Where the reported amounts involve the total disposition of your company's interest in reserve properties, mines and mills, please include in Exhibit B the name of the property, the net book value of the disposal and the proceeds.

Items 32 and 33—For Column A only, report only new debt of your company including non-equity advances from parents and affiliates in Item 32. Report proceeds from new equity offerings and any equity advances from parent and affiliated organizations and partners in Item 33. For Column B only, report the combination of any debt and equity proceeds that can be specifically associated with your domestic uranium operations.

Item 34—This is a residual category which should include all other sources of funds. For Column B only, report any additional sources of funds specifically identified with the domestic uranium activities including contract advances from customers and other non-cash adjustments affecting the change in working capital. If the reported amount exceeds $5 million, please provide an explanation in Exhibit B.

Item 35—This item is the sum of Items 30 through 34.

Items 36 through 40—Item 40 is the total additions made during the current year to property, plant and equipment. For Column B only, the amounts reported for Items 36 through 39 should include only those current year expenditures which were capitalized. If the amount reported on Item 39 exceeds 20 percent of Item 40 and also exceeds $5 million, please include an explanation of the nature of the capitalized item in Exhibit B.

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ENERGY INFORMATION ADMINISTRATION
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Schedule C

Schedule C: Uranium Industry Financial Status—Specific Instructions (continued)

Items 41 and 42—For Column A only, Item 41 should report any dividends or distributions of equity earnings to partners. Item 42 should report any debt reduction payments including amounts to parent and affiliated groups. For Column B only, report any amounts in Column A that can be specifically associated with your domestic uranium operations.

Item 43—This is a residual category that should include all other uses of funds. For Column B only, include any amounts that can be directly associated with the domestic uranium operation. If the amount reported in this column exceeds $5 million, please provide an explanation in Exhibit B.

Items 44 and 45—Item 44 is the sum of Items 40 through 43. Item 45 is the difference between Items 35 and 44.

Part III: Planned Capital Expenditures for 1986

Items 46 through 50—For Column B only, report estimated amounts consistent with the classifications for Items 36 through 40. Column A should be completed in total only.

Part IV: Income Statement

Items 51 through 55—For Column B only:

Item 51—Report sales of uranium concentrate.
Item 52—Report sales of uranium ore.
Item 53—Report all revenues from mining and milling services.
Item 54—Report all other operating revenues not reported in Items 51 through 53.

The amounts reported for Items 51 through 54 should include intra-company transfers to foreign subsidiaries valued at market prices. If the amount of Item 54 exceeds $5 million and is more than 20 percent of Item 55 (Column B), please include an explanation of the source of this revenue. Include earnings (losses) from unconsolidated affiliates, partnerships and joint ventures as a part of Item 68. Operators of mines or mills should report the gross amounts of partnership or joint venture activity in all items and use Item 68 to offset earnings or losses attributable to non-operator interests. If it is the practice of the company to include them on a proportional or other basis, please describe the method used in Exhibit B. Item 55 is the sum of Items 51 through 54. For Column A, report total operating revenues only.

Item 56—Report the expenses incurred for exploratory drilling and for other expensed exploration costs. These include expenses incurred for drilling in search of new mineral deposits, or extensions to known ore deposits and for drilling at the location of a discovery up to the time that the company decides that sufficient ore reserves are present to justify commercial exploitation. Also included are direct drilling expenses incident to exploratory drilling such as access roads, site preparation, geological and other technical support, and sampling and drill hole logging.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status—Specific Instructions (continued)

Capitalized portions of exploration and development costs related to unsuccessful efforts and written off during the current year should also be included in this item. However, major writedowns of properties, plant and equipment should not be included in this item but reported in Item 72, Extraordinary Items. If any of the reported amounts include the company's share of such expenditures from joint venture activity, please include the name of the venture, your proportional share and the amount.

Item 57—Report the production expenses for open-pit mining, underground mining, and solution (in situ) mining. Include expenses for labor, extensions of mining facilities and equipment, backfilling excavated areas, maintenance and repairs, operating supplies, expenditures for tracks, conveyors, electric cables, drainage, ventilation shafts, access roads (if expensed), and royalties and other payments out of production. Also include expenses for hauling uranium ore to the mill. Include the cost of uranium ore mined by others for your company's account and expenses incurred to mine uranium ore for the account of other companies. Fees earned for mining uranium for the account of others should be reported as Item 53.

Item 58—Report the expenses incurred by the domestic uranium segment to process and treat uranium bearing materials to produce U308. Include the expenses associated with the production of U308 concentrate from conventional milling, leach of mill tailings, and U308 recovery from phosphoric acid, copper dumps, and other uranium bearing materials. Include expenses for labor and material received; processing of the material for treatment in the plant; treating, extracting, and recovering the uranium; and drying and packaging. Include the costs of milling done by others for your account and the expenses incurred for toll mining (i.e., milling for account of others).

Item 59—This is the sum of Items 57 and 58.

Item 60—Report purchases of uranium concentrate for resale. All other product purchases, including concentrate purchased for your company's own account for conversion, uranium hexafluoride, enriched uranium, nuclear fuel assemblies, and unspecified uranium-bearing materials should be included as a part of Item 61.

Item 61—This amount should include selling expenses, inventory change including writedowns of inventory to market, taxes related to production and reserves, transportation, carrying costs of shut down or inactive mines and mills, and other expenses associated with production. Do not include loss reserves on future contract delivery commitments which should be reported in Item 68.

Item 62—For Column A report total operating expense only. Column B is the total of Item 56 plus the sum of Items 59 through 61.

Item 63—For Column B only, this amount should include only current period DD&A. Major writedowns of PP&E should be reported in Item 72.

Item 64—Report all other expenses entering into the determination of operating income (loss) not otherwise specified herein.

Item 65—This is the sum of Items 62 through 64.

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ENERGY INFORMATION ADMINISTRATION
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Schedule C

Schedule C: Uranium Industry Financial Status—Specific Instructions (continued)

Item 66—This item is the difference between Items 55 and 65.

Item 67—Report interest expense in Column A only. For Column B, no allocation or interest expense should be made.

Item 68—This item should include reserve contingencies, unusual items such as law suit settlements, or equity earnings (losses) from unconsolidated affiliates, cost basis dividends, gain or loss on dispositions, minority interest income and other items of income and expense not accounted for in Items 51 through 67. For Column B only, report the amounts that can be specifically associated with the domestic uranium activities. If the reported amount exceeds $5 million, please include an explanation in Exhibit B as to the items and amounts making up the total. Please note also that if the amount reported in this item increases pretax income or reduces pretax loss, it should be bracketed.

Item 69—This item is the net of Items 66 through 68.

Item 70—Column A should be as provided for in the company's accounting records and financial reporting. For Column B only, this item should be calculated based on pretax income (Item 69). Special tax provisions which cause this amount to vary from the statutory rate of 46.0 percent, such as investment tax credits, statutory depletion, capital gains etc., should be reflected in the computed amount. If current year losses can be carried over or used to offset pretax income in other lines of business, the tax benefit accrued as a result should be allocated to this item. Tax reductions associated with major writedowns reported in Item 72 should not be included here.

Item 71—This item is the net of Items 69 and 70.

Item 72—For Column B only, this item should include any amount associated with domestic uranium operations which has been reported in Column A for this item. In addition, this item should include major writedowns of PP&E (net of taxes) and losses from discontinued operations if they have been reported elsewhere in the company's annual report and 10-K filing. Please include an explanation in Exhibit B if the amount reported in this item varies from your normal reporting practice.

Item 73—This item is the net of Items 71 and 72.

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status

Part I: Balance Sheet

ASSETS	(Thousand Dollars) A. Consolidated Level	B. Uranium Sector Only
Current Assets		
1. Total Inventories		
2. All Other Current Assets		
3. Total Current Assets		
Noncurrent Assets—Property, Plant and Equipment		
4. Mining and Exploration Properties	▨	
5. Deferred Intangible Development Mining Costs	▨	
6. Mining and Milling—Property, Plant and Equipment	▨	
7. All Other Property, Plant and Equipment		
8. Less Accumulated Depletion, Depreciation, and Amortization		
9. Net Property, Plant and Equipment		
10. Idle Facilities (Net)		
11. Investments and Advances—Unconsolidated Subsidiaries		
12. All Other Noncurrent Assets		
13. Total Noncurrent Assets		
14. Total Assets		
LIABILITIES AND EQUITY	**A. Consolidated Level**	**B. Uranium Sector Only**
Liabilities		
15. Total Current Liabilities		
Deferred Liabilities		
16. Long-Term Debt and Advances		▨
17. Other Deferred Items		▨
18. Total Long-Term and Deferred Liabilities		
19. Total Liabilities		
Equity		
20. Capital Contribution		▨
21. Other Equity		▨
22. Retained or Undistributed Earnings		▨
23. Total Equity		
24. Total Liabilities and Equity		

25. **Please include an estimate of domestic uranium mine and mill tailings reclamation and equipment disposal costs as of the balance sheet date, including any amount already accrued in Item 18 B above.**

$______________________________

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ENERGY INFORMATION ADMINISTRATION
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Schedule C

Schedule C: Uranium Industry Financial Status (continued)

Part II: Sources and Uses of Funds

(Thousand Dollars)

SOURCES	A. Consolidated Level	B. Uranium Sector Only
26. Net Income		
27. Depletion, Depreciation, and Amortization		
28. Deferred Income Taxes		
29. Other Funds from Operations		
30. Total Funds from Operations		
31. Disposition of Property, Plant and Equipment (Book Value)		
32. New Long-Term Debt		
33. New Equity Offerings and Contributions		
34. Other Sources of Funds		
35. Total Sources		

USES	A. Consolidated Level	B. Uranium Sector Only
36. Capitalized Exploration Activity	▨	
37. Milling Plant and Equipment	▨	
38. Mining Plant and Equipment	▨	
39. Other Property, Plant and Equipment	▨	
40. Total Additions to Property, Plant and Equipment		
41. Dividends and Earnings Distributions		
42. Debt Reduction and Advance Repayments		
43. All Other Uses		
44. Total Uses		
45. Increase (Decrease) in Working Capital		

Part III: Planned Capital Expenditures—1987

	A. Consolidated Level	B. Uranium Sector Only
46. Exploration Activity	▨	
47. Milling Plant and Equipment	▨	
48. Mining Plant and Equipment	▨	
49. Other Property, Plant and Equipment	▨	
50. Total Additions to Property, Plant and Equipment		

Comments:

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ENERGY INFORMATION ADMINISTRATION
Uranium Industry Annual Survey
Schedule C

Schedule C: Uranium Industry Financial Status (continued)

Part IV: Income Statement

	(Thousand Dollars)	
Operating Revenues	**A. Consolidated Level**	**B. Uranium Sector Only**
51. Uranium Concentrate Sales	▨	
52. Uranium Ore Sales	▨	
53. Mining and Milling Services	▨	
54. Other Operating Revenues	▨	
55. Total Operating Revenues		
Operating Expenses		
56. Exploration	▨	
57. Production—Mining	▨	
58. Production—Milling	▨	
59. Total Production Expenses	▨	
60. Purchases for Resale—Concentrate	▨	
61. Other Operating Expenses	▨	
62. Total Operating Expenses		
63. Depletion, Depreciation and Amortization		
64. General and Administrative Expenses		
65. Total General and Operating Expenses		
66. Operating Income (Loss)		
Other Items of Income and Expense		
67. Interest Expense		▨
68. Other Revenues and Expenses		
69. Pretax Income (Loss)		
70. Income Tax Expense		
71. Net Income (Loss) from Continuing Operations		
72. Extraordinary Items and Cumulative Effects of Accounting Changes		
73. Net Income (Loss)		

Comments:

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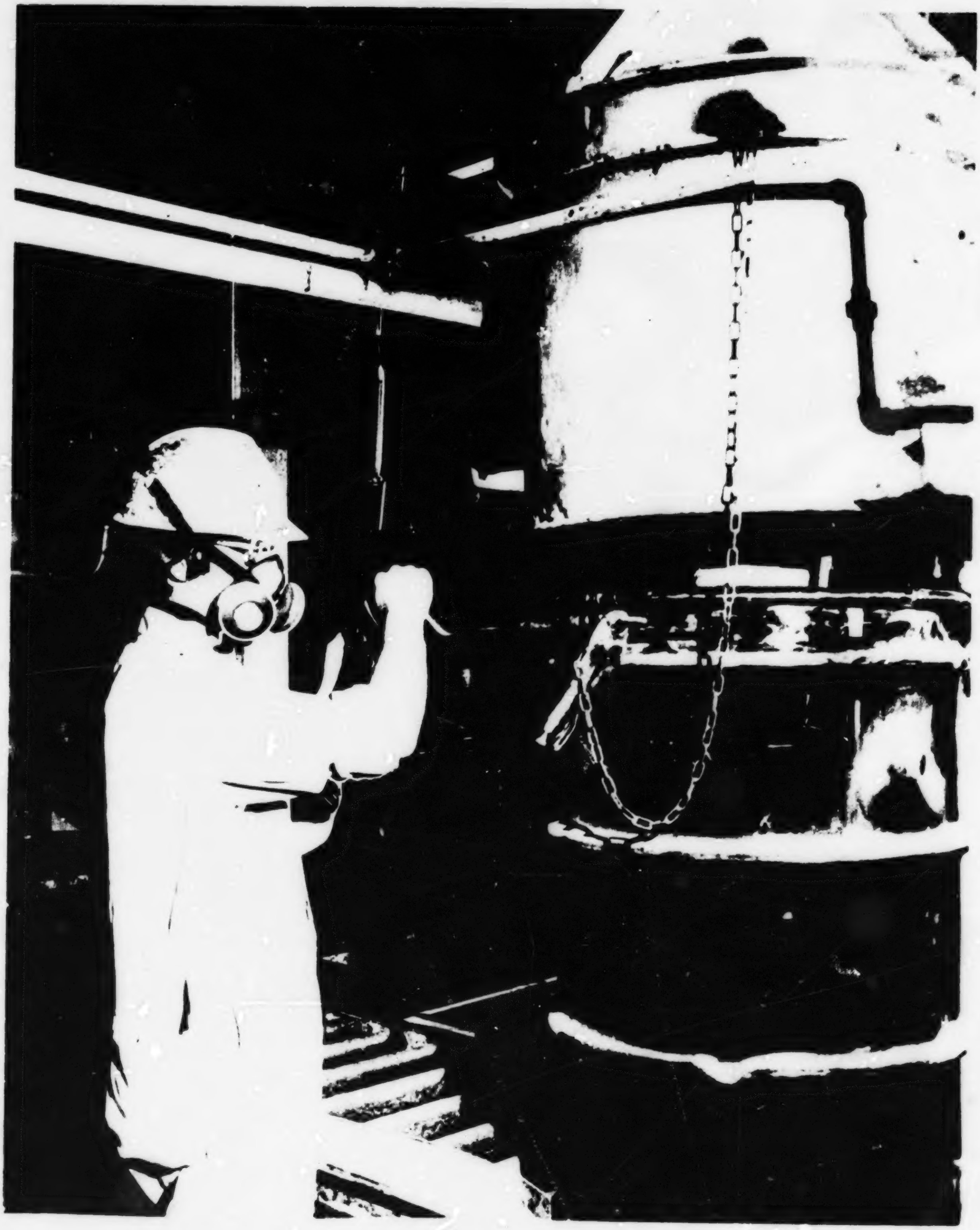

Preparing a drum of uranium oxide for shipment. The shipped product, in the form of a dry powder, contains about 95 percent uranium oxide.

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Glossary

Average Delivered Price: The weighted average of all contract price commitments and market price settlements in a delivery year.

Contract Price: The delivery price determined when contract is signed. It may be a fixed price or a base price escalated according to a given formula.

Cost Model for Economic Undiscovered Resources: A computerized method in which the estimated uranium endowment and cost factors are used to develop random variables describing the undiscovered resources ultimately expected to be discovered and produced at current-dollar cost of less than $30, $50, and $100 per pound of U_3O_8.

Cutoff Grade: The lowest grade of uranium ore, in percent U_3O_8, at a minimum specified thickness that can be mined at a specified cost.

Development Drilling: The drilling done to evaluate precisely the size, grade, and configuration of an ore deposit that has been determined to be of commercial value. It does not include solution mining drilling for production.

Domestic Uranium Industry: Resource ownership, exploration, development, mining, milling, and other beneficiation activities that are directed specifically toward the ultimate production of uranium from mineral deposits located in the United States and offering that uranium for sale in the commercial marketplace.

Economic Reserves: The uranium ore reserves that occur in known mineral deposits located in the United States, of such size, grade, and configuration that they could reasonably be expected to be recoverable at or below specified production costs (the costs that would have to be incurred to produce the uranium in the form of U_3O_8 concentrate) with currently proven mining and processing technology and under current regulations. Estimates of the quantities of uranium, ore grades, and deposit configurations are based on specific sample data, measurements of the deposits, and knowledge of their characteristics.

Exploration Drilling: Drilling done in search of new uranium deposits, to extend known ore deposits, or at the location of a new discovery, up to the time a company decides that sufficient ore reserves are present to justify commercial exploitation.

Floor Price: A minimum price specified in market price contracts as the lowest purchase price of the uranium, even if the market price falls below the specified price. The floor price may be related to the seller's production costs.

Forward Costs: The operating and capital costs (in current dollars) still to be incurred in the production of uranium from estimated reserves, which are used in assigning the uranium reserves to cost categories. Forward costs include the costs of labor, materials, power and fuel, royalties, payroll and production taxes, insurance, and applicable general and administrative costs. Previous expenditures (before the time of the reserve estimates) for such items as property acquisition, exploration, mine development, and mill construction are excluded from the forward cost determination. Income taxes, profit, and the cost of money are also excluded. Thus, forward costs are generally lower than the market prices required to make production and sale of the uranium economical for the producer.

***In Situ* Mining:** The recovery, by chemical leaching, of the valuable components of a mineral deposit without physical extraction of the rock (also referred to as "solution mining").

Market Price: The prevailing price level in the uranium market at a given time. It generally reflects a published spot price, is mutually agreed upon by the contracting parties, or is independently determined by an unbiased outside arbitator.

Market Price Contract: A contract in which the price of uranium is not specifically determined at the time the contract is signed but is based instead on the prevailing market price at the time of delivery. A market price contract may include a floor price that provides a lower limit on the eventual settled price. The floor price and the method of price escalation generally are determined when the contract is signed. The contract may also include a price ceiling or a discount from the agreed-upon market price reference.

Market Price Settlement: The price paid for uranium delivery under a market price contract. The price is commonly (but not always) determined at or sometime before delivery and may be related to a floor price, ceiling price, or discount.

Milling of Uranium: The recovery of uranium from ore mined by conventional methods, such as underground or openpit mining.

National Uranium Resource Evaluation (NURE): A program begun by the U.S. Atomic Energy Commission (AEC) in 1974 to make a comprehensive evaluation of U.S. uranium resources and continued through 1983 by the AEC's successor agencies, the Energy Research and Development Administration (ERDA) and the Department of Energy (DOE). The NURE program included aerial radiometric and magnetic surveys, hydrogeochemical and stream sediment surveys, geologic drilling in selected areas, geophysical logging of selected boreholes, and geologic studies to identify and evaluate geologic environments favorable for uranium.

Net Imports: The uranium imports minus exports in a given delivery period.

Nuclear Reactor: An apparatus in which the nuclear fission chain can be initiated, maintained, and controlled so that energy is released at a specific rate. The reactor includes fissionable material (fuel), such as uranium or plutonium; fertile material; moderating material (unless it is a fast reactor); a heavy-walled pressure vessel; shielding to protect personnel; provision for heat removal; and control elements and instrumentation.

Optional Delivery Commitment: A provision to allow the conditional purchase or sale of a specific quantity of material in addition to the firm quantity in the contract.

Processing of Uranium: The recovery of uranium obtained by nonconventional methods, such as *in situ* mining or as a byproduct of copper or phosphate mining.

Property: A specific piece of land with uranium ore reserves that may be developed for production, or undeveloped land that is held for the ultimate purpose of economically recovering the uranium.

Solution Mining: See " *in situ* mining."

Solution Mining Drilling: Drilling done exclusively for solution mining production, including all drilling after the initial development drilling, such as pattern development and monitor wells.

Spot Market: The buying and selling of uranium for immediate or very near-term delivery, typically involving transactions for delivery of up to 500,000 pounds U_3O_8 within a year of contract execution.

Spot Market Price: The prevailing price for uranium bought and sold on the spot market (i.e., small quantities of material for short-term delivery).

Unfilled Requirements: The requirements for natural uranium feed for enrichment not covered by usage of inventory or supply contracts in existence as of the end of the survey year.

Uranium: A heavy, naturally radioactive, metallic element (atomic number 92). Its two principally occurring isotopes are uranium-235 and uranium-238. Uranium-235 is indispensable to the nuclear industry because it is the only isotope existing in nature to any appreciable extent that is fissionable by thermal neutrons. Uranium-238 is also important because it absorbs neutrons to produce a radioactive isotope that subsequently decays to plutonium-239, an isotope that also is fissionable by thermal neutrons.

Concentrate: A yellow or brown powder that is the product from the milling process, containing uranium that has been removed from waste rock. Synonymous with yellowcake, U_3O_8, or uranium oxide.

Enriched Uranium: Uranium enriched in the isotope U-235.

Fabricated Fuel: Fuel assemblies composed of an array of fuel rods loaded with uranium dioxide pellets, manufactured after conversion of enriched uranium hexafluoride to uranium dioxide.

Uranium Hexafluoride: A compound (UF_6) obtained by chemical treatment of U_3O_8, which forms a vapor at temperatures above 56 degrees Centigrade. UF_6 is the form of uranium required for the enrichment process.

Uranium Deposit: A discrete concentration of uranium mineralization that is of possible economic interest.

Uranium Endowment: The uranium that is estimated to occur in rock with a grade of at least 0.01 percent U_3O_8. The estimate is made before consideration of economic availability.

Uranium Ore: Rock containing uranium mineralization (typically 1 to 4 pounds of U_3O_8 per ton or 0.05 to 0.2 percent U_3O_8) that can be mined economically.

Uranium Resource Categories: Three classes of uranium resources, reflecting different levels of confidence in the quantities reported.

Reasonably Assured Resources (RAR): The uranium that occurs in known mineral deposits of such size, grade, and configuration that it could be recovered within the given production cost ranges, with currently proven mining and processing technology. Estimates of tonnage and grade are based on specific sample data and measurements of the deposits and on knowledge of deposit characteristics. RAR correspond to DOE's Reserve category.

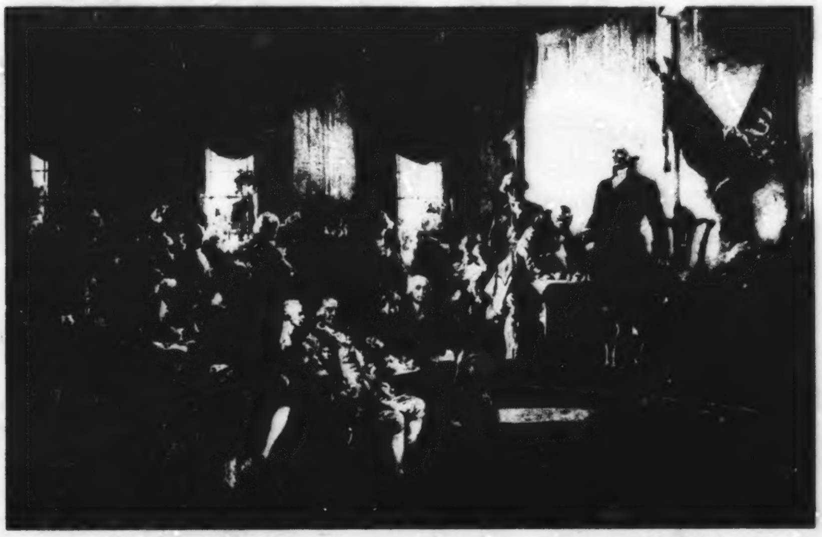
Estimated Additional Resources (EAR): The uranium in addition to RAR that is expected to occur, mostly on the basis of direct geological evidence, in extensions of well-explored deposits, little explored deposits, and undiscovered deposits believed to exist along well-defined geological trends with known deposits, such that the uranium can subsequently be recovered within the given cost ranges. Estimates of tonnage and grade are based on available sampling data and on knowledge of the deposit characteristics, as determined in the best known parts of the deposit or in similar deposits. EAR correspond to DOE's Provable Potential Resource category.

Speculative Resources (SR): Uranium in addition to EAR that is thought to exist, mostly on the basis of indirect evidence and geological extrapolations, in deposits discoverable with existing exploration techniques. The locations of deposits in this category can generally be specified only as being somewhere within given regions or geological trends. As the term implies, the existence and size of such deposits are speculative. The estimates in this category are less reliable than estimates of EAR. SR correspond to DOE's Possible Potential Resource plus Speculative Potential Resource categories.

Usage Agreements: Agreements under which the Department of Energy previously accepted natural UF_6 delivered early by its enrichment customers as a result of deferrals of enriched UF_6 deliveries.

AFTER THE DECLARATION OF INDEPENDENCE OUR FOUNDING FATHERS WROTE SOMETHING EVEN MORE IMPORTANT.

Ten years after the signing of the Declaration of Independence our founding fathers created what historians have called the greatest single document struck off by the hand and mind of man.



Our founding fathers created the Constitution of the United States.

For the first time in history, power was granted by the people to the government, and not by the government to the people.

The freedom unleashed by the Constitution allowed Americans to develop their talents and abilities to the fullest. And attain what is now known the world over as the *American Dream*.

As we commemorate the Bicentennial of the Constitution, there is no better way for you as an American to reaffirm the principles for which our country stands than to learn more about the Constitution.

The words we live by.

THE CONSTITUTION

The words we live by

To learn more about the Constitution write: Constitution, Washington, D.C. 20599. The Commission on the Bicentennial of The U.S. Constitution. Ad Council

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